PHYSICAL
SCI. LIB.

TN
24
C3
A33
NO. 157

MINERAL RESOURCE POTENTIAL OF THE ROCKHOUSE BASIN WILDERNESS STUDY AREA KERN AND TULARE COUNTIES, CALIFORNIA

1986

CALIFORNIA DEPARTMENT OF CONSERVATION
DIVISION OF MINES AND GEOLOGY

THIS SUMMARY REPORT WAS PREPARED FOR
THE U.S. BUREAU OF LAND MANAGEMENT
UNDER CONTRACT NO. 4A-551-CT3-440039 BY
THE CALIFORNIA DEPARTMENT OF CONSERVATION,
DIVISION OF MINES AND GEOLOGY

STATE OF CALIFORNIA
GEORGE DEUKMEJIAN
GOVERNOR

THE RESOURCES AGENCY
GORDON K. VAN VLECK
SECRETARY FOR RESOURCES

DEPARTMENT OF CONSERVATION
RANDALL M. WARD
DIRECTOR

SPECIAL REPORT 157

DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS
STATE GEOLOGIST

MINERAL RESOURCE POTENTIAL

of the

ROCKHOUSE BASIN WILDERNESS STUDY AREA, KERN AND TULARE COUNTIES, CALIFORNIA

by

Gary C. Taylor, Ralph C. Loyd, John T. Alfors, John L. Burnett, Melvin C. Stinson, Rodger H. Chapman, Mike A. Silva, C. Forrest Bacon, Marjorie M. Bushnell, and Thomas P. Anderson

CONTENTS

Page

Executive Summary iii

Introduction 1
- Location and Accessibility 1
- Previous Investigations 2
- Present Investigations and Acknowledgments 2

General Geology and Lithology 3
- Plutonic Rocks 3
- Metamorphic Rocks 4
- Volcanic Rocks 4
- Unconsolidated Quaternary Deposits 5
- Structure 5
- Paleontology 5

Mineral Deposits 6
- Mining History 6
- Mining Claim List 6
- Geology of Mineral Deposits 6

Geothermal Resource Evaluation 13

Oil and Gas Resource Potential 14

Evaluation of Radiometric Data 15

Geophysical Studies and Evaluation 17

Geochemical, Heavy Mineral, and Petrographic Studies 21
- Geochemical Survey 21
- Examination of Heavy Mineral Samples 23
- Petrographic Examinations 24
- Summary 27

Mineral Resource Assessment and Land Classification 28
- Metallic Resources 28
- Non-Metallic Resources 29

References 31

Geochemical Data and Statistical Analysis (microfiche) ..... In Packet

Illustrations

Page

Figure 1. Location map of the Rockhouse Basin Wilderness Study Area, Kern and Tulare counties 1

Figure 2. Map showing distribution of unpatented mining claims as of November 8, 1983. 10

Figure 3. Airborne gamma-ray spectrometer and magnetometer survey of study area 16

Figure 4. Bouguer gravity map of study area and adjacent area 19

Plate 1. Geologic map showing mines and prospects ..... In Packet

Plate 2. Aeromagnetic map ..... In Packet

Plate 3. Sample locality map showing mines and prospects ..... In Packet

Plate 4. Map showing sample localities with elements present in anamalous amounts and mining claims-prospects ..... In Packet

Plate 5A. Map af study area shawing sample sites where non-magnetic heavy mineral fractians were evaluated under petragraphic microscope emersian ail maunts, binacular microscape, and short-wave ultra-vialet fluarescent light ..... In Packet

Plate 5B. Gealagic map af study area showing stream sediment sample lacalities and respective drainage basins where elements are present in anamalous amounts as detected by chemical analyses ..... In Packet

Plate 5C. Gealagic map af study area shawing nanmagnetic heavy minerol fraction sample lacalities and respective drainage basins where elements are present in anamalaus amounts as detected by chemical analyses ..... In Packet

Plate 5D. Gealagic map af study area showing heavy minerol sample lacalities and respective drainage basins where barium is present in anamalaus amounts ..... In Packet

Plate 5E. Gealagic map af study area showing heavy mineral sample lacalities and respective drainage basins where tungsten is present in anamalaus amounts ..... In Packet

Plate 5F. Gealagic map af study area shawing heavy mineral sample lacalities and respective drainage basins far samples which are slightly ta maderately radiaactive ..... In Packet

Plate 6A. Land-classificatian map showing patential far tungsten and molybdenum ..... In Packet

Plate 6B. Land-classificatian map showing patential for antimany, arsenic, capper, gald, lead, silver, and zinc ..... In Packet

Plate 6C. Classification map showing potential far barite, feldspar, gem stanes, and limestane ..... In Packet

Plate 6D. Classificatian map shawing patential far uranium-tharium ..... In Packet

Tables

Table 1. Knawn mines and prospects of the Rockhause Basin Wilderness and cantiguous areas 7, 8

Table 2. Unpatented mining claims as af November 8, 1983 9

Table 3. NURE stream sediment sample data 15

Table 4. Magnetic susceptibility af rack samples collected in the Rockhause Basin Wilderness Study Area 17

Table 5. Elements determined by inductively caupled argan plasma emissian spectrometry and their lawer units of determinatian (ppm) 21

Table 6. Elements used far the selection of anamalous stream-sediment samples, their threshald values, and numbers and percentages of samples at ar abave threshald 22

Table 7. Elements used for the selectian af anamalaus heavy-minerol-concentrate samples, their threshald values, and numbers and percentages af samples at ar above threshald 22

Table 8. Selected minar-element data, in parts per million, for stream-sediment samples fram Rackhause Basin, average Mesozaic plutanic racks in the Sierra Nevada, average granadiarites worldwide; and heavy-minerol-cancentrate samples fram Rackhause Basin 23

Table 9. List af heavy mineral samples that have detectable radiaactivity 23

Table 10. Tabulated list af relative minerol abundances in heavy mineral samples 26

Table 11. U.S. Bureau of Land Management mineral-land classificatian scheme 28

EXECUTIVE SUMMARY

This report presents the results of a geologic, energy, and minerals (GEM) survey of the Rackhouse Basin Wilderness Study Area (WSA) in the southern Sierra Nevada. The survey was conducted by the California Department of Conservation, Division of Mines and Geology (DMG) during the latter part of 1983 under Contract No. YA-551-CT3-440039 with the U.S. Bureau of Land Management (BLM). The work was contracted as part of a BLM study to determine the suitability of the Rockhouse Basin area for recommendation for inclusion into the National Wilderness Preservation System.

The Rackhouse Basin Wilderness Study Area encompasses an uplifted erosional surface of older (pre-Middle Jurassic) metasedimentary rocks (Kernville Series) which have been intruded by a succession of younger (Middle Jurassic to Cretaceous) granitic plutons of varying composition. The metamorphic racks accur as a large roof pendant or as smaller xenoliths. These metamorphic racks are vertically to steeply dipping, and consist principally af quartzites, schists, and phyllites with minor assemblages of marble, slate, hornfels, and metavolcanic rock. With few exceptions, all known occurences of mineralization are confined to the metamorphic rocks, and the exceptions appear to be canfined ta areas cantaining late-stage pegmatites.

The mineral resaurce potential of the WSA was evaluated and classified an the basis of geological, geachemical, and geophysical data developed during the study. The results af the GEM survey indicate that parts of the study area have a minerol resource potential. Same specific characteristics are presented below:

- The WSA has a substantiated high potential for small deposits of tungsten with accessory molybdenum and capper minerolizatian associated with small tactite zones developed along metasedimentary-igneous contacts.

- Minar barite production has been recarded fram praspects within the WSA that have a law-to-moderate barite resaurce potential. However, outside the WSA, toward VABM Bear, the southward continuation of this stratigraphic harizon of sedimentary barite has supparted maderate histaric praductian and contains an extensive substantiated barite resource.

- Geochemical and radiometric data indicate a moderate resource potential for small deposits af uranium associated with pegmatites alang the southwestern end of Long Valley and in the Chimney Peak - Lamant Meadaw area.

- A small, undeveloped, but substantiated occurrence af gem quality turquoise exists near the southwestern end of Long Valley.

- Bodies of marble (metamarphased limestane and dolomite) and quartz-feldspar-bearing pegmatite dikes are present. The marble has variable magnesium content and shaws partial-ta-camplete silicification and variabile widths; pegmatite dikes are small and discantinuous. Thus, variabilities in tonnage, compositian, grade, thickness, and extent are nat favarable far cammercial utilization of either commadity.

- The geologic terrane has no potential for the occurrence of petroleum resources and has low patential for the development of geothermal resources in the area, even though it lies immediately west of the Coso Known Geothermal Resource Area.

- Geachemical data indicate a law resaurce patential for deposits af lead-zinc-silver-gald in the sauthern and narthern parts of the study area possibly associated with undiscavered are-farming hydrathermal systems.

Suggestions for further studies. Additional detailed geochemical and geaphysical studies in specific areas might mare closely delineate possible hydrothermal minerolization, particularly in the Big Pine Meadaw area and the sauthern and northern parts af the study area. Alsa, detailed graund magnetic investigatians of small magnetic anamalies occurring near metasedimentary-igneaus rock cantacts immediately east af the Long Valley-Lamant Meadows Road might delineate possible concealed tactite zones.

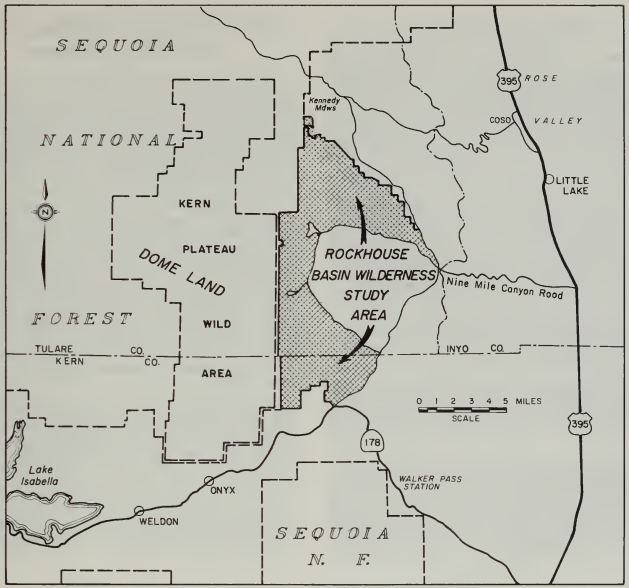


Figure 1. Location Map of the Rockhouse Basin Wilderness Study Area, Kern and Tulare counties.

INTRODUCTION

A geologic, energy, and minerals (GEM) survey of the Rockhouse Basin Wilderness Study Area was conducted in 1983 by the California Department of Conservation, Division of Mines and Geology (DMG) as a part of a Bureau of Land Management study to determine the suitability of the area for recommendation for inclusion in the National Wilderness Preservation system.

Location and Accessibility

The study area is located approximately 65 miles northeast of Bakersfield and covers approximately 37,000 acres immediately east of the Sequoia National Forest boundary between latitude 35° 44′ and 36°00′N, and longitude 118°00′ and 118°10′W in Tulare and Kern counties, California (Figure 1).

The topography of the area ranges from moderate, pinon pine-covered slopes to barren, precipitous cliffs and steep-walled canyons. The highest point in the area is an unnamed peak at an elevation of 8,315 feet, and the lowest point is about 3,200 feet in the valley floor along Canebrake Creek near Highway 178.

The study area is accessible by several roads (Figure 1). The paved Nine Mile Canyon - Kennedy Meadows road provides access along the northeastern part of the area; a graded road from Highway 178 to Chimney Meadow provides access to the southeastern part. A partially paved road extending from Lamont Meadow to Long Valley provides access to the central and western part. Additional access to the central and northeastern area is provided by the unimproved Chimney Meadow-Rockhouse Basin road and by several other unimproved roads that branch off. The Pacific Crest Trail and numerous well-maintained horse trails, especially along Rockhouse Basin, provide additional foot access to the area.

Previous Investigations

The geology of Rockhouse Basin was originally studied and mapped by Robert Webb in 1933 to 1936 at a scale of 1:125,000 (Webb, 1937, unpublished thesis). His work was subsequently incorporated by the California Department of Conservation, Division of Mines and Geology into the compilation of the Bakersfield 1°x 2° Sheet for the Geologic Atlas of California by A.R. Smith in 1965, at a scale of 1:250,000. Webb's mapping, as published in Volume 36, California Journal Mines and Geology at a scale of 1:125,000, was used as a reconnaissance base in the present study. Colman (1934) and McNeil (1936) examined and prepared proprietary consulting reports on the barite properties. Additional barite property evaluations were made by Kundert (1953) and Weber (1965). An aeromagnetic map (U.S. Geological Survey, 1982) of the area compiled at a scale of 1:62,500 from a survey flown at a flight elevation of 9000 feet and a line spacing of approximately one-half mile is available. In addition, the Bakersfield Sheet of the Bouguer Gravity Map of California at a scale of 1:250,000 covers the area (Hanna and others, 1975). The Lamont Peak and Onyx 15-minute U.S. Geological Survey quadrangle maps provide topographic coverage of the area at a scale of 1:62,500, and the base map for Plate 1 was compiled from those sheets.

A report on the adjacent Domelands Wilderness (Bergquist and Nitkiewicz, 1982) contains data on the ages of intrusive rocks within the area and includes some geology along the common border.

Moderate mineral exploration, particularly along and within the Kernville Series, has been conducted since discovery of the barite deposits in the 1920s; additional exploration was initiated during the 1940s and 1950s when a price support for tungsten was in effect. Unfortunately, results of some of the investigations made at that time were proprietary and not published and are, therefore, generally unavailable.

Present Investigations and Acknowledgements

The field investigations of the study area by DMG were conducted by G.C. Taylor, R.C. Loyd, J.L. Burnett, and S.L. Kohler during the months of August through October 1983. Interpretation of published geophysical data and of additional magnetic ground surveys was performed by R.H. Chapman. The geochemical data interpretation and petrographic examinations were conducted by J. T. Alfors, M.C. Stinson, M. Silva, R.C. Loyd, and T. Anderson.

The geological field work consisted of several hundred miles of foot traverses to remap the area on an air photo base at a scale of 1:20,000 and to collect rock and stream sediment samples. Six-hundred forty-eight stream sediment samples, from 294 sample localities, were collected by G.C. Taylor, C. Heinke, M. Steinhauff, K. Aldridge, and R.C. Loyd (Plate 2) and prepared for analysis by M. A. Silva. The results of spectrographic and fire assay analyses, performed by Acme Analytical Laboratories of Vancouver, British Columbia, and DMG petrographic examinations provided the basis for the detailed geochemical study that was performed. All known mines and prospects were examined, sampled, and, in some cases, mapped in detail at a scale of 1 inch equals 50 feet.

We gratefully acknowledge the close cooperation and support that was provided to DMG by the supervisors and staff of the Bureau of Land Management. We are especially indebted to Glenn Carpenter, area manager, and Bob Buttner, station manager, in providing the use of the Chimney Peak Fire Station as a base camp and to Rob Waiwood, District Geologist, in providing information and photo coverage of the area. Additionally, we would like to thank the following DMG personnel: Jeff Tambert for the extensive drafting that was required for the accompanying illustrations, Danielle Riordan for typing, and Cora Pingree for final manuscript preparation.

GENERAL GEOLOGY AND LITHOLOGY

by
Gary C. Taylor

The Rockhouse Basin Wilderness Study Area (WSA) is situated near the southern terminous of the Sierra Nevada. It is bounded on the east by the precipitous, 4,000-foot scarp of the Sierra Nevada fault and on the west by the 3,000-foot, V-shaped canyon of the south fork of the Kern River. The area encompasses an elevated erosional surface of metasedimentary rocks that have been intruded by granitic intrusives of the Sierra Nevada batholith. Occurring in the area are three distinguishable plutonic rocks (Plate 1) that become more felsic with decreasing age and range in composition from gabbro-quartz diorite to grandiorite-granitic aplite. These are the Summit Gabbro (Jurassic and/or Triassic), the Sacatar Quartz Diorite (Jurassic), and the Isabella Granodiorite (Cretaceous). The metamorphic rocks of the Kernville Series were mostly derived from fine-grained, arenaceous to argilliferous clastic sedimentary rocks, with minor calcareous and volcaniclastic interbeds that were deposited in a shallow water environment. Subsequent burial, intense folding, and biotite subfacies metamorphism has led to the formation of metasedimentary rocks; principally, quartzities, schists, phyllites with minor assemblages of marble, slate, and hornfels. These metamorphic rocks occur within a three-mile-wide, northwest-striking, steeply eastward-dipping roof pendant and as smaller scattered xenoliths within the plutonic rocks west of the pendant. Minor outcrops of Tertiary olivine basalts occur along the western border of the area, and minor erosional remnants of older Quaternary gravels mantle parts of Rockhouse Basin.

Development of the present local drainage patterns in the study area is largely controlled by joints developed within these granitic intrusives as modified by subsequent regional uplift and extensive erosion.

Plutonic Rocks

SUMMIT GABBRO

The Summit Gabbro of Miller and Webb (1940) is the oldest intrusive rock in the area and also has the smallest areal distribution. It is exposed within the northeastern part of the WSA as two distinct, north-trending septa, whose lengths greatly exceed their width, as a small, detached intrusion along this same trend, and as a small irregular shaped intrusion near the northern boundary of the study area. These rocks form the highest topographic elevations within the area.

The Summit Gabbro may be an early border phase of the Sacatar Quartz Diorite (Bergquist, 1982). It is typically a coarse- to medium-grained, inequigranular to porphyritic hornblende gabbro. A discordant hornblende-biotite mineral pair was obtained for the Sacatar Quartz Diorite with a mean hornblende age of 145.4 million years (m.y.) (Bergquist, 1982). Thus, the Summit Gabbro is probably of Jurassic and/or Triassic Age. Contacts appear to be vertical, are typically very sharp, and usually provide clear evidence of the intrusive nature of the Sacatar Quartz Diorite into the Summit Gabbro. The Sacatar is commonly foliated along these contacts. However, areas that contain an assemblage of mixed rocks exist along some of the contacts. Where a gabbroic phase of the Sacatar Quartz Diorite exists and is highly contaminated with inclusions and schlieren of the Summit Gabbro or fine-grained diorite, it becomes difficult to separate the intrusive relationship.

Although typically a hornblende gabbro, the Summit Gabbro appears, in places, to approach a pyroxenite in composition with a crystalline matrix of greenish-black clinopyroxene (augite). These small bodies of pyroxenite typically show a common spatial association to contact zones and probably represent small-scale magmatic differentiation within the Summit Gabbro.

SACATAR QUARTZ DIORITE

The Sacatar Quartz Diorite of Miller and Webb (1940) includes medium- to fine-grained equigranular mesocratic hornblende quartz diorite (tonalite) and equigranular leucocratic hornblende granodiorite. This latter rock-type occurs principally in the northern part of the study area where it is in contact with the Summit Gabbro, Kernville Series, and with the younger Isabella Granodiorite.

As previously mentioned, a discordant hornblende-biotite mineral pair was obtained for the Sacatar Quartz Diorite within the Domelands with a mean hornblende age of 145.4 m.y. (Bergquist, 1982). This date is older than any other K-Ar ages reported for southern Sierra Nevada and nearby Tehachapi Mountains by Evernden and Kistler (1970), and Ross (1980, 1983). Thus, the minimum age of Middle Jurassic obtained from the hornblende confirms the Jurassic age of the Sacatar Quartz Diorite assigned by Miller and Webb (1940).

The Sacatar includes both quartz-diorite (tonalite) and hornblende granodiorite with the quartz-diorite being the more abundant. The granodiorite, being the most felsic rock-type within the Sacatar, is sometimes difficult to distinguish from mafic phases of the Isabella Granodiorite. As shown on Plate 1, substantial areas of mixed rocks occur between the Sacatar and the Isabella where contact zones are transitional.

ISABELLA GRANODIORITE

The Isabella Granodiorite, which was named by Miller (1931), is composed of granite, quartz-monzonite, and quartz-diorite. It occurs throughout the study area with almost continuous exposure in the southern part of the area. Typically, specimens of the Isabella are medium- to coarse-grained, inequigranular, leucocratic rocks; however, texture may vary locally from equigranular to coarsely porphyritic with prominent phenocrysts of potassium feldspar.

A single age date from biotite of 81.1 m.y. was determined for a sample of Isabella Granodiorite that was dated by the U.S. Geological Survey in the course of the Domeland Study (Bergquist, 1982). This Late Cretaceous minimum age of 81.1 m.y. is in close agreement with other K-Ar biotite ages of the Isabella and equivalent units in the vicinity of the Rockhouse Basin area as reported by Ross (1980, 1983) and Evernden and Kistler (1970).

The Isabella Granodiorite, the most felsic intrusion within the study area, typically exhibits sharp contacts with both the Kernville Series and the Sacatar Quartz Diorite. However, transitional mixed rock zones do exist in certain areas. An especially good locality is located immediately west of Big Pine Meadow. Here, randomly sampled specimens of Isabella Granodiorite cannot be distinguished from Sacatar Quartz-Diorite. An additional facies

of the Isabella Granodiorite, a coarse-grained, foliated granite in which layers of quartz alternate with layers of feldspar, tends to occur along the margin of the pluton, but is not limited to this occurrence.

APLITE, PEGMATITE, AND BASIC DIKES

The Sacatar Quartz Diorite and the Isabella Granodiorite show, especially in the southern part of the area, extensive development of aplite, pegmatite, and granodiorite dikes. Immediately west of the Bureau of Land Management's (BLM) Long Valley campground, numerous large granodiorite dikes have intruded the Sacatar Quartz Diorite along a northeastly trend. With near parallel strikes, these dikes have low dip angles and can be traced southward to the Isabella Granodiorite.

In turn, the Isabella Granodiorite has been intruded by late-stage aplite and pegmatite dikes that are particularly pervasive in parts of the area. A large pegmatite dike with a width in excess of 30 feet is located just outside of the study area at upper Chimney Meadows. This dike is composed of almost pure potash feldspar and quartz and has been mined commercially as a source of silica (Webb, 1937). Moderate-sized (2-5 foot) pegmatite dikes are numerous around Long Valley and typically contain large feldspar crystals, quartz, and books of biotite.

Aplite dikes are found in both the Sacatar Quartz Diorite and Isabella Granodiorite. Typically, they are leucocratic, fine-grained to coarsely granular, and in the area west of VABM Long, Sec. 31, T23S, R36E, show an abundance of pink- to ruby-colored garnet crystals disseminated within a matrix of white feldspar. A coarsely crystalline quartz-feldspar pegmatite dike forms a prominent, northwest-trending outcrop near the Lamont Meadow-Long Valley Road. Several of these late-stage felsic dikes within the Isabella Granodiorite are, in turn, intruded by mafic dikes. Well exposed at the upper part of Lamont Meadow, these mafic dikes exhibit a microcrystalline texture and appear to be basaltic in composition.

Metamorphic Rocks

The metamorphic rocks within the study area belong to the Kernville Series of Miller (1931). In this report, they are separated into two map units: (1) a massive, light-gray to black quartzite that occurs in the northern part of the study area, and (2) an undifferentiated unit that contains quartz-mica schists, quartzites, and phyllites, with minor assemblages of marble, slate, hornfels, and metavolcanic rock. In addition, due to economic and metallogenic considerations, both the barite-bearing sedimentary horizons and tungsten-bearing calcareous interbeds that occur within undifferentiated Kernville Series rocks were mapped and are shown on Plate 1. This sequence of metasedimentary rocks may be, in part, the lateral equivalents of Paleozoic sedimentary rocks east of the Sierra Nevada, or they may be correlative with Mesozoic metamorphic roof pendants to the north (Bergquist, 1982).

The metasedimentary rocks exposed in the northern part of the area consist largely of a gray-to-black, massive quartzite, with minor interbeds of quartz-mica schist and phyllite. Quartzite ranges in texture from massive to thinly laminated, and from coarsely crystalline to crypto-crystalline; it typically exhibits an iron-stained, weathered surface. In places, the quartzite is very micaceous and shows development of chlorite schist lenses along contacts with granitic rocks. Contact zones vary from extensive zones of mixed rock exhibiting large subparallel septal masses to narrow zones measurable in inches. Although the most extensive cross sectional exposure of undifferentiated Kernville Series within the Chimney Peak roof pendant lies outside of the study area, the Rockhouse Basin-Chimney Meadows road provides a well exposed section.

Quartzites within the study area are typically light gray to bluish gray, medium-grained, thinly laminated, and range from nearly pure quartzite to micaceous quartzite. Exposed throughout the roof pendant, quartzites aggregate several thousand feet of thickness and are present as thick beds within larger areas of the Kernville Series. Quartzite is intercalated with thin calcareous lenses (marbles) in both the area of the Rockhouse tungsten property known as Kern-Sierra and in the area of the barite mine (T23S, R36E, Sec. 34).

Interbedded with the quartzites are well-foliated, greenish-gray to dark gray, fine-grained schists that range in composition from quartz-muscovite-biotite-garnet-schists to quartz-mica schists. Phyllites, typically massive and very dark in color, and exhibiting good cleavage, are well exposed in the area of the barite mine.

Several zones of calcareous sediments and marbles up to 100 feet thick occur in the area. Marbles are white to bluish-gray, thinly bedded, fine-grained to coarsely crystalline, and range from nearly pure calcite to dolomitic varieties. Marble beds are associated with and contain interbeds of barite. Silicification of the marble commonly occurs near intrusive contacts and, locally, zones of quartz-epidote-garnet skarn have been developed along the contacts. Metamorphosed volcanic rocks occur within the Kernville Series as minor intercalated beds within the metasedimentary sequence. Metavolcanic rocks typically exhibit equigranular and uniform composition, light gray color, and appear massive in outcrop. All metavolcanic beds, commonly tens of feet thick, are subparallel to the enclosing metasedimentary rocks and probably are hypabyssal intrusions.

Volcanic Rocks

Tertiary volcanic rocks do not occur within the Rockhouse Basin Wilderness Study area; however, these rocks do occur immediately adjacent to the western border of the area. Due to this nearby location, these rocks were mapped and field-checked, and a description is included in this report.

A northeast-trending ridge immediately west of VABM Long is capped by an olivine-augite basalt flow. Flow rocks are typically dark-gray to black on a fresh surface, light-gray where weathered, exhibit a microcrystalline groundmass and isolated xenocrysts (2-40mm) of gray, glassy quartz. Measuring less than 100 feet thick, the basalt shows minor development of columnar jointing; extensive fracturing and landsliding has resulted in the accumulation of disjointed rubble piles downslope. Underlain by Isabella Granodiorite (Cretaceous), this flow is of Tertiary age and is probably contemporaneous with an olivine basalt from Black Mountain, located about four miles westward, which yielded a whole-rock Miocene Age of 12.3 m.y. (Bergquist, 1982). Other olivine basalts from the Kern Plateau have yielded dates of 3.6 m.y. (Pliocene) and younger (Moore and Dodge, 1980).

Unconsolidated Quaternary Deposits

Unconsolidated deposits of Quaternary age in the study area consist of extensive colluvial veneers of slopewash and talus aprons at the base of steeper slopes and broad alluvial fans.

Slopewash deposits mantle most granitic slopes and some slopes underlain by resistant metamorphic rocks. Stream channels are filled with coarse, poorly sorted gravels with minor deposits of finer grained sediments occuring where stream gradients decrease. Thinly laminated, organic rich alluvial sediments on the order of tens of feet thick occur within Big Pine, Lamont, Chimney, and several other smaller intermontane meadows.

Highly resistant metamorphic rocks, principally quartzites, have developed extensive talus aprons in the higher relief areas. Large disjointed granitic blocks and rubble piles are present along Chimney Creek and occur at the base of the cliffs prominent along the southern border of the study area.

Broad alluvial fans have developed along the lower drainage of Chimney Creek, within Rockhouse Basin, and in the area immediately north of Highway 178. An older, partly eroded, alluvial gravel sequence underlies Rockhouse Basin.

Structure

The metamorphic rocks that form the Chimney Peak roof pendant have a general structural trend of N45°W and a vertical to near-vertical eastward dip. Assuming that the sequence is not overturned or isoclinally repeated, the oldest rocks occur along the western margin and become progressively younger in an eastern direction. No evidence of regional folding was found during the field investigation; although, locally, large blocks of metamorphic rocks have been disjointed and rotated along plutonic contacts by magmatic stoping. Thus, the roof pendant rocks can be characterized as an eastward-dipping homoclinal sequence of metasedimentary rocks.

Although showing little regional structural deformation, individual intraformational metasedimentary sequences show intense small-scale deformation. Calc-silicate rocks, carbonate lenses, and quartzites commonly show closed, recumbent, and isoclinal folds with vertical plunging-fold axis and development of boudinage structure. Examples of these small-scale structures are common throughout the roof pendant rocks but become very pronounced adjacent to contacts with plutonic rocks.

The most important structures in the area on a regional scale are a group of circular concentric granitic intrusions. Part of the Domeland area is underlain by one of these intrusions, and several more have been identified to the northwest. A truncated circular intrusion was mapped at Lion Meadows in the Hockett Peak quadrangle (Burnett, 1963). These structures are most obvious on high-altitude photographs and LANDSAT satellite imagery.

These structures are the eroded tops of granitic plutons, and the circular bands are alternating layers of mafic and felsic intrusive rock. The eastern edge of the circular structure beneath the Domeland underlies the western edge of the Rockhouse Basin WSA and has influenced drainage development within the study area.

The granitic rocks typically exhibit a prominent northeast and subordinate northwest set of joints. However, the northwestern part of the study area is dominated by circular jointing associated with the Domeland circular structure. Toward the southeast, the circular jointing gives way to joints with a strong east-west orientation. Analysis of LANDSAT satellite imagery suggests that most of the surface drainage and the orientation of peaks and ridges are controlled by these regional joint patterns.

The metamorphic rocks exhibit moderate jointing, lineament development, and, in places, minor faulting, all of which probably represent structural adjustments that occurred during emplacement of the Cretaceous plutons. Structural evidence for minor faulting exists within the barite-bearing horizon, which appears to have been offset by small northeast-trending strike-slip faults.

Several prominent northeast-trending lineaments occur in Quaternary sediments within and along the eastern margin of Rockhouse Basin. Although these lineaments exhibit definite tonal color differences on color air photos, suggesting the presence of a groundwater barrier, and in places are coincident with an erosional surface developed on older alluvial gravel, they, in all probability, do not indicate displacement along Quarternary faults. Being on trend with a prominent northeast joint set, these lineaments probably reflect buried bedrock structures.

The study area is bounded by two major faults: the Sierra Nevada fault zone, which is located immediately to the east and shows several thousand feet of post-Pliocene vertical displacement, and the Kern Canyon fault, a major pre-Quaternary (Burnett, 1976) north-trending structure located about 18 miles west of the study area. Several pre-Quaternary faults have been shown by Jennings (1975) as trending into the study area; however, no evidence was developed during this study to indicate Quaternary movement along any of these faults.

Paleontology

No material was obtained from the metamorphic rocks of the Kernville Series during the course of this study that proved to be of organic origin. Although careful searches were made in metasedimentary horizons that were thought to be favorable environments for the preservation of organic meterial, no fossil remains were detected. Earlier workers in this area also failed to find any fossil remains of any type.

MINERAL DEPOSITS

by

Gary C. Taylor and John L. Burnett

Mining History

DMG conducted geological, geochemical, and geophysical studies within the Rockhouse Basin Wilderness Study Area (WSA) in order to provide an assessment of the potential for mineral resources.

The detailed examination of all known mines, prospects, and mineralized zones in the Rockhouse Basin WSA (listed in Table 1) was performed by DMG personnel. Locations pertaining to mining claims were collected by: examination of claim records at BLM offices, examination of mineral location and assessment records from Inyo, Kern, and Tulare county courthouses in Independence, Bakersfield, and Visalia, research into Federal and State mine data files, and contact with claimholders.

There are no patented mining claims in the WSA. Courthouse and BLM records indicate that 43 claims are currently located within or close to the study area (Table 2, Figure 2). Although the area was undoubtedly prospected during the middle-to-late 1800s and the early 1900s when gold placers along the South Fork of the Kern River were active, no records exist of any mining claims during this period; the first claim of record is the 1920 discovery by William Lyle Skinner of the barite property, which because of its isolation and inaccessibility remained undeveloped until 1930. Development of the barite properties, under Paso Baryta mines and other operators, continued through the 1930s and 1940s, and the last recorded shipment of barite by the Drilling Mud Division of Macco Company to their Rosamond Mill occurring in December 1951 (Kundert, 1953).

Tungsten claims were filed in the late 1930s, and demand spurred by World War II price supports led to other tungsten discoveries. Recorded tungsten production began in 1942 with construction of a 50-ton gravity concentrator at the Kern-Sierra mine, which was worked intermittently in 1942 and 1943 (Krauskopf, 1953). Tungsten prices underwent a rapid decline at the end of the World War II, and all production ceased until U.S. Government price support was reinstated in 1951 during the Korean War. Minor tungsten production was recorded for both the Western #1 and the Do Good-Humbug properties during the early 1950s, but all operations had ceased by 1956 when the federal government tungsten purchase program was suspended. Currently, there are no active mines within the area.

Of the three properties that have recorded tungsten production, only the Do-Good/Humbug claims are within the actual Rockhouse Basin Study Area; however, both the Kern-Sierra and Western No. 1 properties are included because of their close proximity. All tungsten properties occur either on the igneous-metasedimentary roof pendant contact or within small detached metasedimentary septa. According to Krauskopf (1953), production began from the Kern-Sierra in 1942; however, examination of the underground and surface workings reveals only minimal stope development, suggesting that actual production was minor. The Western No. 1, developed by a short adit and minor stoping, produced several shipments of hand-cobbed ore in 1953 (Lawrence Fox, personal communication, 1983). The Do Good-Humbug mines are developed by an open-cut/ shaft and caved adit, respectively. Surface workings at the Do Good mine support minor production, but actual tonnages are unavailable.

Geology of Mineral Deposits

Geological environments considered to have potential for the development of mineral resources were examined in detail during the course of this study. All areas underlain by metasedimentary rocks of the Kernville Series were extensively field-checked and mapped at a 1:20,000 scale, with particular emphasis given to igneous contact zones and calc-silicate horizons within the Kernville Series.

BARITE

Barite occurs along a strike distance of approximately three miles as discontinuous lenses, within a bedded metasedimentary sequence of the Kernville Series. The metasedimentary sequence includes organic-rich slate, metasiltstone, micaceous quartzite, ferruginous schist, and coarsely crystalline, fetid marble beds. Thicknesses of the barite lenses range from less than 1 foot to 30 feet and the bedding is near vertical to vertical. Records indicate that open pit and open cut mining exploited local areas of high specific gravity barite. One adit, for example, was driven "several hundreds of feet along a 4 to 6 foot wide, granular bed of barite" (Kundert, 1953). Due to sloughing of pit walls, most pits reveal little in-situ barite available for examination.

Typically white in color, barite also occurs in discrete gray- to brown-stained beds or as baritic marble. Records indicate that the thickness of barite lenses and grade of material was highly variable. Forty-nine actual measured thicknesses averaged 28 feet with a maximum of 68 feet recorded (Busey, 1936). The sizes of the pits examined during this study are consistent with these figures. Samples from selected zones would produce specific gravities of 4.2 to 4.4 (McNeil, 1934), with wallrock averaging 3.2 to 3.9; however, Kundert's 1953 report cites Macco Company as stating the "Nine Mile Deposit was of sub-standard grade and averaged 3.6 to 3.75."

Although the barite-bearing metasedimentary horizon is intermittently exposed along a three-mile (15,000-foot) trend, very little information has been developed for evaluation of down-dip extension of exposed ore zones. Contact with Macco Drilling and Mud Division and other operators revealed that no evaluation of down-dip ore extensions by drilling was ever performed. However, some underground data is available and some inferences can be drawn. McNeil (1934) and Busey (1936) both document a tunnel being driven approximately 400 feet below the highest vein exposure; the tunnel was several hundred feet long and carried an ore width of 6 to 10 feet. This is probably the tunnel exposed in the bottom of the open cut on the Edmond's property and is collared at the 7,500-foot elevation. The southernmost open cut, immediately south of VABM Bear, is at an elevation of 8,160 feet; the northernmost prospect exposure, approximately one-half mile northwestward of the Rockhouse Basin Road-Pacific Crest Trail crossing, is at an elevation of 6,950 feet. Considering the vertical to near vertical bedding of the barite lenses and the absence of major fold structures or faults, it seems reasonable to infer that the barite lenses are distributed over a vertical distance of at least 1,200 feet. Measured depths (Busey, 1936) and existing open cuts tend to support this interpretation.

Table 1. Known mines and prospects, Rockhouse Basin Wilderness and contiguous areas. Underlined names refer to properties with mineral resource potential; those not underlined have no potential or are poorly exposed and a determination cannot be made.

MAP NO.	NAME (COMMODITY)	LOCATION BY LAND SURVEY	LATITUDE LONGITUDE	OWNERSHIP	GEOLOGY	PRODUCTION AND WORKINGS	RESOURCE ASSESSMENT
1.	Do Good prospect (tungsten)	T23S,R35E Sec. 36	35.889 118.146	Francis Friestad 1016 Lexington Way Rockford, Ill. 61108	A vertical tactite zone trending N34W. Located in a metasedimentary xenolith in Sacatar Quartz Diorite. Dump consists of 1) tactite made up of epidote, massive red garnet showing blebs of disseminated molybdenite. 2) coarse-grained hornblende diorite, 3) coarse grained quartz veins, 4) some fine-grained, layered igneous rock. Workings inaccessible.	Development consists of a 15'x40'x55' ft. deep shaft/slot cut. Production records unavailable - estimate several hundred tons of ore milled.	Selected grab samples from dump contained less than .01 percent WO_3, and .05 percent molybdenum. A low trace silver and less than .01 percent copper. Low potential for a tungsten resource.
2.	Sure Thing prospect (gold?)	T23S,R36E SE¼ Sec. 36	35.883 118.147	Francis Friestad 1016 Lexington Way Rockford, Ill. 61108	A quartz vein 8" thick is exposed for 8'. The vein trends N10E and dips 15° to the east. The quartz is slightly limonite stained. Country rock is Sacatar Quartz Diorite.	Small shallow prospect pit.	One chip sample of quartz contains trace gold and silver.
3.	Humbug prospect (tungsten)	T23S,R36E NE¼ Sec. 31	35.884 118.136	Francis Friestad 1016 Lexington Way Rockford, Ill. 61108	Xenolith of metasediments enclosed in Sacatar Quartz Diorite. Bedding in the xenolith trends N43W and dips 75°N.E.	Inclined shaft (caved), several shallow prospect pits. Apparently a minor amounts of ore was milled at the Do Good Mine mill.	Selected grab samples from dump contained a maximum of .006 percent WO_3, .0001 percent molybdenum, .005 percent copper, .002 percent zinc and trace gold and silver. Minor potential for a tungsten resource.
4.	Rockhouse/Kern Sierra prospect (tungsten)	T23S,R36E Undivided	35.898 118.130	Albert T. Tucker 803 Los Palmas Novato, CA 94947 Albert L. Tucker 1237 Denlyn St. Novato, CA 94947 James A. Tucker 1 Los Alandros Novato, CA 94947	A 15 ft. wide tactite zone enclosed in Sacatar Quartz Diorite. The western side has scattered scheelite, calcite, garnet and epidote.	Developed by 2 (390 and 95 ft) adits, 2 shafts, 3 shallow cuts and 1 extensive cut along contact utilized for drilling access. Development in the longest adit includes 120 ft. of drifting and minor stoping. Minor production recorded in 1942-43 - records unavailable.	Examination of backs and working face with ultraviolet lamp revealed zones that would be estimated to carry 0.5 - 1.5 percent WO_3. A low resource potential for tungsten exists.
5.	Unknown (tungsten claim #1)	T23S,R36E Sec. 30	35.898 118.134	Unknown	The mineralized zone is a 20 ft. wide garnet rich tactite lying between Sacatar Quartz Diorite and deeply weathered granodiorite (probably Isabella). Malachite staining along fractures.	Developed by an inclined caved shaft - production records unavailable - probably very minor if any.	Selected samples from shaft face contained a maximum of trace amounts WO_3, .8 percent copper, .4 oz/ton silver, .03 percent zinc and trace gold. A low sub-economic resource for copper, silver and zinc indicated.
6.	Oixie Queen claim (gold)	T23S,R36E Undivided	35.900 118.093	Heirs of Chester O. Smith, and E.E. Cooper Inyokern, CA 93527	Gray to black micaceous quartzite and chert. Bedding and foliation trend N30E and dip 70° W. Some malachite staining along fractures.	The prospect is developed by a shaft, 3 pits and several trenches.	Samples selected from dumps showed a maximum of .04 percent copper, .3 oz/ton silver, .05 percent zinc, trace lead and gold.
7.	Golden Stack #4 prospect (gold?)	T23S,R36E Undivided	35.894 118.114	The Gold Depository and Loan Co., 2124 Union Street San Francisco, CA 94123	The area shows scatted pieces of white vein quartz in micaceous schist and quartzite.	An undeveloped prospect with no discovery workings.	No samples taken - field examination revealed no evidence of mineralization.
8.	Unknown (Barite prospect #1)	T23S,R36E Undivided	35.889 118.083	Unknown	A bedded deposit containing white, fine-grained, crystalline barite, between micaceous quartzite and light gray muscovite schist. The average width of the ore zone is estimated to be 20 feet thick. The bedding and foliation trend N25W and dip 67°E.	The deposit is developed by two open cuts and a trench.	High potential for additional barite resources at depth; ore grade and width variable.
9.	Triangle 8 prospect (barite)	T23S,R36E Undivided	35.893 118.093	Joseph T. Edmonds & Carmen A. Edmonds Star Route #1, Box 43, Mojave, CA	A bedded deposit containing white, crystalline barite stained greenish-yellow due to clay and limonite. The barite zone, 3 ft. thick, is conformably bedded with micaceous metasiltstone.	The deposit is developed by 2 open cuts, 2 pits, several trenches and a shaft.	High potential for additional barite resources at depth; ore grade and width variable.
10.	Unknown (barite prospect #3)	T23S,R36E NE¼ Sec. 29	35.903 118.107	Unknown	A bedded deposit containing discontinuous pods of impure barite. Pods are 1-2' wide and 2-4' long. Bedding and foliation trend N45W and dip 80°SW.	The deposit is developed by an open cut and a shaft.	High potential for additional barite resources at depth; ore grade and width variable and tonnage limited by topography.

Table 1. Continued

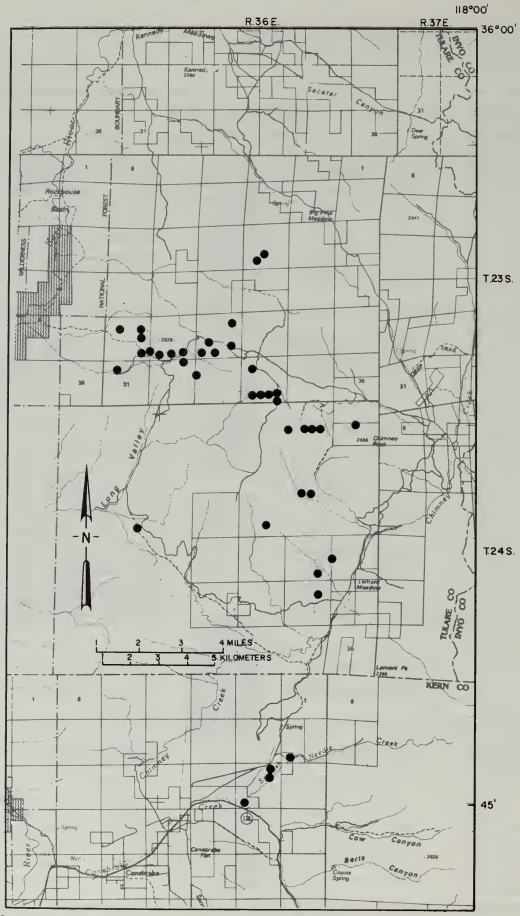
11.	Unknown (barite prospect #2)	T23,24S, R36E Undivided	35.880 118.072	Unknown	A bedded deposit containing white, crystalline barite in stratigraphic conformity with limonite-stained metasiltstone, fine-grained schist and quartzite. No barite was found in place.	The property is developed 4 pits and cuts.	High potential for additional barite resources at depth; ore grade and width variable.
12.	New Pyrite prospect (barite)	T23S,R36E Sec. 28	35.898 118.105	Carmen A. Edmonds Star Route #1 Box 43, Mojave, CA 93501	The country rock is a black to gray slate. No barite seen.	No development.	Field examination revealed no surface workings or evidence of mineralization.
13.	Triangle C prospect (barite)	T23S,R36E Undivided	35.899 118.098	Heirs of Chester Smith P.O. Box 134 Inyokern, CA 93527	Scattered cobbles of white crystalline barite ore were seen. The wall rocks are reddish-black to orange ferruginous schist. Many layers of bright orange limonite schist are interlayered with the black folia. The bedding and foliation trend N75W and is near vertical and crenulated.	The deposit is developed by one pit.	High potential for additional barite resources at depth; grade and tonnage variable.
14.	Western #1 (tungsten, barite)	T24S,R36E Undivided	35.810 118.042	Lawrence J. Fox 205 Sierra Vista St. Ridgecrest, CA 93555 Don Joe McKernon 1301 Bowman Rd. Ridgecrest, CA 93555 Colin Donaldson 2029 Frame Way #211 Alameda, CA 94501	A tactite zone at the contact between roof pendant and Isabella Granodiorite. The barite is present in the metamorphic rock. Scheelite is present as scattered, high-grade masses.	The deposit is developed by several pits and one adit. All are badly caved. 2 shipments (5 tons) of WO_3 concentrate which grossed $12,000.00	Based on owner's statements - a low potential for additional tungsten resources.
15.	Blue Gem prospect (turquoise)	T24S,R36E NW¼ SW¼ Sec. 18	35.839 118.145	Stephen R. Smith P.O. Box 27 Inyokern, CA 93527	Turquoise occurs as irregular masses and fracture fillings along and below a contact between Isabella Granodiorite and an aplite-pegmatite dike. The other side of the dike is in contact with mica schist and quartzite.	The deposit is developed by a pit 8 ft. by 10 ft. in size.	Some samples of turquoise revealed good color and hardness; thus meeting gem quality standards. There is a moderate potential for gem quality turquoise.
16.	White Cross #1 prospect (feldspar, quartz)	T24S,R36E NE¼ Sec. 27	35.815 118.087	John W. Nicoll Weldon, CA 93283	Quartz and feldspar in a large pegmatite dike. Fracture surfaces are coated with a green mica. Minor iron oxide stains were present around books of biotite. Muscovite is the most abundant mica.	A 150 ft. long open cut exposes the eastern side of the deposit.	Selected samples showed a maximum of .003 oz/ton silver, .0001 percent copper, .001 percent lead, .0001 percent zinc and trace gold. A low potential exists for quartz and feldspar.
17.	Unknown	T24S,R36E SE¼ Sec. 5	35.872 118.109	Leonard Thompson E.L. Cox, and Walter Fermazin	Small 6-8" quartz-aplite dike striking N45°W. Minor iron oxides on fracture surface.	Old claim dated May 2 1931 - no evidence of any development work.	Not sampled.
18.	Unknown prospect	T22S,R36E SW¼ Sec. 31	35.962 118.136	William Smith Carl Standard, and Gordon Standard	Small 10" iron stained quartz vein occurring on contact of Isabella Granodiorite and Kernville Series Quartzite. Strike N10°W.	Old claim located August 22, 1938 - no evidence of any development work.	Not sampled.
19.	Red Knob #1 and #2 prospect (gold)	T24S,R36E SW¼ Sec. 7	35.869 118.143 35.851 118.140	Ralph G. Barrett, Richard B. Rogers, Chester O. Smith	Several small xenoliths of Kernville Quartzite appear to have been altered by intrusion of pegmatite-aplite dikes. Lots of secondary iron staining (hematite and limonite) present small finely disseminated sulfides and vugs present both in quartzite and Sacatar Quartz Diorite.	Claims located June 15, 1955 - two small shallow prospect pits - no production.	Selected chip samples showed a maximum .03 percent copper, .002 percent zinc, .017 oz/ton silver and trace lead and gold, low metallic content indicates minor subeconomic resource potential.
20.	Sky Blue prospect (gold, gem stone)	T23S,R36E	35.883 118.153	Francis Friestad 1016 Lexington Way Rockford, Ill. 61108	1-ft aplite-pegmatite vein with trend N25°W and dip 15°SW. Small 1-3mm ruby garnets, and beryl crystals, feldspar crystals, biotite books.	Small shallow pit.	Selected samples showed a maximum of .0005 percent zinc and lead, .0001 percent copper, .003 oz/ton silver and trace gold. Garnets and beryl are small and fractured, not meeting gem stone criteria.
21	Sidewinder #1 (tungsten?)	T23S,R36E NE¼ Sec. 32	35.883 118.116	Unknown	N45°W trending calc-silcate/marble zone. 40-60' wide zone of marble and calc-silcate interbedded with other metasedimentary rock. Vertical to 80° eastward dip. No development of tactite zone.	No development.	Silica content and other contaminents preclude cement utilization.

Table 2. Unpatented mining claims as of November 8, 1983.

REPORT DATE: NOV 8, 1983 UNITED STATES DEPARTMENT OF THE INTERIOR PAGE NO: 2457
STATE: CALIFORNIA PCN: LT892PP1 BUREAU OF LAND MANAGEMENT

MERIDIAN: MOUNT DIABLO GEOGRAPHIC INDEX

LEGAL DESCRIPTION TWSHP	RANGE	SEC	SUBDIV	GEO BLM CTY DIST	SERIAL CASE NO.	TYPE	CLAIM NAME/NUMBER	CLAIMANT(S)	LEAD FILE	COUNTY BOOK/PAGE	LOCATION DATE	LATEST ASSMT YR	CASE CLOSED
23 S	36 E	15	SW		135709	LD	SECOND LOOK #1	SMITH K W SMITH DARLENE	135709		10/25/1983	0000	
			SW		135710	LD	SECOND LOOK #2	SMITH K W SMITH DARLENE	135709		10/25/1983	0000	
		28	SE		15524	LD	QUEENETT	SMITH CHESTER D COOPER E E	15523	3204,876	7/25/1974	1982	
			NE		15525	LD	DIXIE QUEEN	SMITH CHESTER D COOPER E E	15523	3192,893	8/07/1973	1982	
			SW		24134	LD	PARROT	EDMONDS JOSEPH T EDMONDS CARMEN A	24134	1866,283	7/29/1955	1983	
			SW		24135	LD	ROSEBUD	EDMONDS JOSEPH T EDMONDS CARMEN A	24134	3161,414	7/24/1955	1983	
			SW		24136	LD	NEW PYRITE	EDMONDS JOSEPH T EDMONDS CARMEN A	24134	3161,416	6/20/1973	1983	
		29	SW		54793	LD	ROCK HOUSE #4	TUCKER ALBERT T TUCKER ALBERT L TUCKER JAMES	54790	1921,520	2/27/1956	1980	
			SW		54794	LD	ROCK HOUSE #5	TUCKER ALBERT T TUCKER ALBERT L TUCKER JAMES	54790	1921,522	3/01/1956	1980	
			SE		85440	LD	GOLDEN STACH #2	GOLD DEPOSITORY LOAN	85269		1/19/1981	1982	
			SE		85441	LD	GOLDEN STACH #3		85269		1/19/1981	1982	
			SE		85442	LD	GOLDEN STACH #4		85269		1/19/1981	1982	
		30	NE		15523	LD	TRIANGLE	SMITH JR CHESTER	15523	1987,431	10/09/1950	1982	
			SE		54790	LD	ROCK HOUSE #1	TUCKER ALBERT T	54790	1921,515	2/11/1956	1980	
			NE		54791	LD	ROCK HOUSE #2	TUCKER ALBERT T TUCKER ALBERT L TUCKER JAMES	54790	1921,516	2/16/1956	1980	
			NW		54792	LD	ROCK HOUSE #3	TUCKER ALBERT T TUCKER ALBERT L TUCKER JAMES	54790	1921,518	2/22/1956	1980	
			SE		54793	LD	ROCK HOUSE #4	TUCKER ALBERT T TUCKER ALBERT L TUCKER JAMES	54790	1921,520	2/27/1956	1980	
		31	NW		66640	MS	PINYON PINE	MCNEW STEPHANIE MCNEW ALLEN	66640	3740,922	2/11/1980	1982	
		32	NE		85439	LD	GOLDEN STACH #1	GOLD DEPOSITORY LOAN	85269		1/19/1981	1982	
			NE		85440	LD	GOLDEN STACH #2		85269		1/19/1981	1982	
		33	NW		85439	LD	GOLDEN STACH #1		85269		1/19/1981	1982	
		34	SE		35155	LD	DEER PEAK	VALPEY WILLIAM C VALPEY FRANCES M	35155	1325,185	11/12/1948	1983	
			SE		35156	LD	MONTE VERDE	VALPEY WILLIAM C VALPEY FRANCES M	35155	3561,763	6/25/1958	1983	
			NW		69973	LD	GREEN SCORPION #4	GRAVES LANDON H FISHER CLIFFORD A	69973	3771,274	6/07/1980	1981	
			SE		103166	LD	O R MINE	GREEN JOY	103166		11/25/1981	0000	
					103875	LD	BARITE KING #ONE	MESSICK MESSICK	103875	3929,596	10/18/1981	1982	
					103876	LD	BARITE KING #TWO		103875	3929,597	10/18/1981	1982	
24 S	36 E	1			99918	LD	LITTLE STEVE	SMITH STEPHEN	99918	3908,948	10/04/1981	0000	
		2			103877	LD	BARITE KING #THREE	MESSICK MESSICK	103875	3929,598	10/18/1981	1982	
					103878	LD	BARITE KING #FOUR		103875	3929,599	10/19/1981	1982	
					103879	LD	BARITE KING #FIVE		103875	3929,600	10/19/1981	1982	
					103880	LD	BARITE KING #EIGHT		103875	3929,601	10/19/1981	1982	
		3			103877	LD	BARITE KING #THREE		103875	3929,598	10/18/1981	1982	
		11	S2		41186	LD	WESTERN NO 1	FOX LAWRENCE J MCKERNAN DON JOE DONALDSON COLIN	41186	3074,764	11/04/1972	1983	
			S2		41187	MS	WESTERN MILL SITE	FOX LAWRENCE J MCKERNAN DON JOE DONALDSON COLIN	41186	3074,764	11/04/1972	1983	
		14	N2		41186	LD	WESTERN NO 1	FOX LAWRENCE J MCKERNAN DON JOE DONALDSON COLIN	41186	3074,764	11/04/1972	1983	
			N2		41187	MS	WESTERN MILL SITE	FOX LAWRENCE J MCKERNAN DON JOE DONALDSON COLIN	41186	3074,764	11/04/1972	1983	
		15	S2		45359	LD	VICTORIC #2	MCCONNELL VICKIE MCCONNELL THOMAS MCCONELL MICKEY		3245,20	4/28/1975	1982	
24 S	36 E	17	SW	107 1	42000	LD	BLUE GEM	SMITH STEPHEN R	42000	3138,749	8/19/1973	1982	
		18	SE		42000	LD	BLUE GEM		42000	3138,749	8/19/1973	1982	
		23	SE		4015	LD	WHITE CROSS NO 1-A	NICOLL JOHN W ROBINSON CLYDE L	4015	3427,463	4/18/1977	1982	
			SE		4016	LD	WHITE CROSS NO 2	NICOLL JOHN W ROBINSON CLYDE L	4016	3427,462	4/18/1977	1982	
		24	NE		4015	LD	WHITE CROSS NO 1-A	NICOLL JOHN W ROBINSON CLYDE L	4015	3427,463	4/18/1977	1982	
		26	NE		4014	LD	WHITE CROSS NO 1	NICOLL JOHN W ROBINSON CLYDE L	4014	3427,461	4/18/1977	1982	
25 S	36 E	12	SW	29	114917	PL	BANE 4	BAUER J WM NEWMAN G H		5481,98	7/20/1982	0000	
		14	SW		114914	PL	BANE 1	BAUER J WM NEWMAN G H		5481,95	7/20/1982	0000	
			NE		114915	PL	BANE 2	BAUER J WM NEWMAN G H		5481,96	7/20/1982	0000	
			NE		114916	PL	BANE 3	BAUER J WM NEWMAN G H		5481,97	7/20/1982	0000	



Base map by U.S. Geological Survey

Figure 2. Map showing distribution of unpatented mining claims as of November 8, 1983. Dots indicate approximate claim location as listed in BLM records.

Earlier workers (McNeil, 1934, and Busey, 1936) interpreted these deposits as epithermal veins. Evidence developed during this study, however, indicates that these deposits originated as syngenetic sedimentary barite (see Petrographic Examination section). Evidence supporting this conclusion includes: (1) all barite lenses are parallel to bedding; (2) there are no crosscutting veinlets or apophyses of barite into wallrock; (3) there is a lack of associated epigenetic sulfide mineralization; (4) very discrete, sharp and uneroded intergrain boundaries exist between calcite-barite minerals; and (5) metamorphic fabric has been developed in the barite.

FELDSPAR

An extensive zone of pegmatite and aplite dikes exists between the southern part of Long Valley and the northern part of Lamont Meadow. This zone represents late-stage magmatic activity for the granitic intrusives. Pegmatite dikes are composed of large potash feldspar crystals, quartz, and coarse books of biotite; aplites are fine-grained, light-colored and contain medium-sized crystals of feldspar, quartz, and muscovite and with locally abundant red to pink garnets. Typical thicknesses of the dikes range from 1 to 4 feet although thicknesses of 8 to 10 feet were noted. Within Section 32, T23S, R37E, located immediately east of the WSA, a large pegmatite dike 30-40 feet in thickness was mined for its high quality feldspar and quartz during the 1920s (Webb, 1937; Tucker and Sampson, 1931 and 1938).

GEM STONES

Turquoise occurs in a small prospect pit (Blue Gem Claim) located in the east slope of a hill immediately southeast of the U.S. Bureau of Land Management campground in Long Valley. Turquoise appears as small (1-4mm) disseminated veinlets and larger irregular shaped blebs within a weathered matrix of pegmatite-granodiorite overlain by an iron-stained micaceous quartzite. Very little turquoise was visible in-place and this only within a small cavity at the base of the pit wall; however, small fracture and vug-filling material appear to be of gem quality. Color ranges from a greenish-blue for oxidized dump material to a dark sky-blue for vein material. X-ray diffraction patterns confirmed the material to be turquoise (personal communication, Dr. James Post, California State University, Sacramento). Turquoise, a basic copper aluminum phosphate ($CuAl_6(PO_4)_4(OH)_8 \cdot 5H_2O$), is a secondary mineral formed from the weathering of pre-existing primary minerals. In this case, geologic and mineralogic relationships indicate that minerals of the apatite group, contained either within the granodiorite and/or pegmatite, were the probable source for calcium phosphate, and minor copper was contributed by oxidation of sulfides contained in the metamorphic quartzite and/or within the pegmatite dike.

MARBLE

Two discrete beds of calcareous sediments containing intercalated beds of marble and several smaller detached pods of marble occur along the margins of the Kernville Series roof pendant. In texture, marble ranges from coarsely crystalline to finely laminated to amorphous where complete silicification or dolomitization has occurred. Thickness of beds is highly variable, but widths never exceed 60 feet, and beds pinch and swell along strike.

QUARTZITE

Quartzite is the most important rock type in the Kernville Series, and locally, attains thicknesses of several thousand feet. As shown on Plate 1, large areas in the northern part of the study are underlain by massive to thinly laminated, gray-colored quartzite. Additionally, extensive beds of quartzite, intercalated with other metamorphic rock types, occur in the barite mine area. Although extensive widths of quartzite exist, relatively little is pure, and most in fact is micaceous, iron-stained, or mixed with other metasedimentary rocks.

TUNGSTEN

The tungsten deposits within the study area all occur within metasedimentary Kernville Series rocks in close proximity to plutonic contact zones. Thus, these deposits are typical Sierra Nevada type contact metasomatic deposits: intrusion of plutonic rocks has thermally metamorphosed pre-existing roof pendant rock and contained calcareous sediments have been altered to form garnet-epidote-pyroxene tactite. Typically, scheelite (calcium tungstate) has been metasomatically introduced into these tactite zones where it occurs as disseminated grains and veinlets with associated minor sulfide mineralization.

Numerous tungsten prospects are listed in Table 1; however, actual tungsten production from the area has been minor. Production records and field examinations reveal that only the Kern-Sierra, Do Good, Western #1, and possibly, the Humbug properties had recorded minimal production. The Kernville Series of metasedimentary rocks within the study area are predominantly composed of metamorphosed clastic and argillic sediments; there is only a minor presence of the intraformational calcareous sediments necessary to form scheelite-receptive tactite zones.

All tungsten prospects occur either along plutonic-metamorphic contact zones or within detached xenoliths of metasedimentary rock close to plutonic contact zones. With the exception of the Western #1 prospect and an unnamed prospect, both of which appear to be associated with the barite-bearing calc-silicate horizon, all other prospects occur along a narrow zone or within detached septa of a calc-silicate horizon near the western boundary of the study area, adjacent to Long Valley and Rockhouse Basin.

Overall, the tactite zones can be characterized as follows: vertical to near vertical bedding, measured widths to a maximum of 20 feet, formation of small lenticular or podiform ore-bearing bodies, disseminated scheelite mineralization within tactite zones, although high-grade blebs and veinlets were noted, and apparent minor down-dip extension. Only two prospects offer a structural insight into vertical distribution of tactite zones. The Kern Sierra property, developed by a shaft and two adits, exposes a vertical section of approximately 200 feet. Over this section, a discovery pit width of 12 to 15 feet of tactite had decreased to 3 to 4 feet at the lower adit. The Do Good property, developed by a 14- to 16-foot open cut/shaft, reveals an apparent marked decrease and/or truncation of the tactite zone over a vertical distance of 60 feet.

URANIUM - THORIUM

Both the DMG geochemical analysis of stream sediments and the Department of Energy (DOE) airborne radiometric surveys and water-sample data confirm the presence of modest uranium enrichment within the study area. Further analysis of these data reveals that anomalous values are predominantly associated with the occurrence of pegmatite dikes representing late-stage magmatic activity of the granitic intrusives.

Optical examination of stream sediments showing anomalous uranium-thorium values and hand-held scintillometer surveys of collected pegmatite samples reveal the presence of radioactive minerals. Radioactive point source emitters within pegmatite hand samples appear as black, vitreous opaque minerals which, without confirmation by X-ray diffraction patterns, have been tentatively identified as allanite. Optical examination of the heavy mineral split of DMG-collected stream samples, reveals an abundance of metamict zircons (i.e., cyrtolite) in which crystal lattice disruption due to radiation damage is readily apparent. Both allanite and zircon, as well as thorite, are common minor accessory minerals of pegmatites; thus, it would appear that uranium-bearing minerals were a result of, and concentrated in, the late stage pegmatite activity.

MINERALIZED ZONES

The Kernville Series of metamorphic rocks ubiquitously contain minor amounts of disseminated sulfides, typically pyrite, which upon weathering have imparted iron-oxide staining to most roof pendant rocks. However, mineralized areas containing base metal sulfides are rare within the study area.

Tactite zones usually contain minor sulfides (pyrite, chalcopyrite, pyrrhotite, molybdenite) and minor secondary copper minerals (azurite, malachite, chrysocolla). Sulfide mineralization occurs along several small veins exhibiting pyrite boxworks 1.5 miles south of VABM Canyon, Sec. 6, T23S, R36E (samples 171 and 176), boxworks are present in samples taken from the Dixie Queen (sample 169), and disseminated sulfides (pyrite) occur in quartz diorite and quartzite 0.5 mile north of the U.S. Bureau of Land Management Long Valley campground (samples 170 and 174).

GEOTHERMAL RESOURCE EVALUATION

by

C. Forrest Bacon

The Rockhouse Basin Wilderness Study Area covered in this report is situated along the crest of the Sierra Nevada a short distance (7 miles) southwest of the Coso Hot Springs Known Geothermal Resources Area (KGRA). Although the horizontal distance between these areas is small, the difference in elevation of approximately 4,000 feet is significant; the two areas are separated by the Sierra Nevada fault zone with Coso Hot Springs lying perhaps isolated on the eastern or down-dropped side. Rockhouse Basin WSA lies within an area classified on the Geothermal Resources of California Map (Higgins, 1980) as "favorable for the discovery at a shallow depth of thermal water..."; however, in this report these lands are shown to have low potential for a significant geothermal discovery. There are no features within the study area to suggest high, near-surface heat flow, nor does the area contain any active or recent volcanism or hot or warm springs occurrences.

The Coso Hot Springs KGRA, on the other hand, is an area containing very young rhyolitic volcanoes and numerous hot springs and fumeroles. A part of the KGRA is currently undergoing geothermal development by the California Energy Company, under terms of their contract with the U.S. Navy, to eventually supply geothermally generated electricity for Navy use at the China Lake Naval Weapons Center.

General Comment

The great majority of the important geothermal resource occurrences throughout the world are in areas of relatively young volcanic activity. Thus, the age and distribution of volcanic rocks is of importance in any assessment of the potential for significant geothermal resources in a given study area. Of perhaps lesser importance but of significance, particularly in the occurrence of some low- and moderate-temperature geothermal resources, is the location of larger faults. These faults often serve as conduits along which waters can circulate to considerable depths and, thus, conductively acquire heat associated with either normal or anomalous temperature gradients.

In the case of volcanic occurrences, the more mafic lavas are believed to form deep within the mantle and rise through relatively long narrow conduits or fissures toward the surface. Silicic lavas, on the other hand, are believed to originate in the lower crust and form relatively shallow, large magma chambers in the upper crust. The large long-lived heat sources thus formed in the near surface regime offer by far the best targets for economic development of geothermal resources.

Geothermal evaluation of an area such as the Rockhouse Basin Wilderness Study Area requires an investigation of its proximity to and association with any large heat sources and also of the physical properties of the country rock within the area. In addition, an investigation is required of any hydrologic system that may serve as a reservoir from which fluids can be extracted or that may play a role in the transport of geothermal fluids.

The general plan for the geothermal portion of this report includes a discussion of the role of volcanism, existence (or lack thereof) of any surface evidence of geothermal resources, geophysical evidence including heat flow and gravity, and comments on the possibility of geothermal occurrence within the area.

Volcanism

The general geology of the Rockhouse Basin WSA is presented in some detail in a previous section of this report and will not be discussed here except as it may relate to the occurrence of geothermal resources.

The pre-Cenozoic rocks of the Sierra Nevada are composed mainly of Mesozoic plutonic rocks of the Sierra Nevada batholith and of lesser amounts of older metasedimentary and metavolcanic rocks that occur as roof pendants. The heat associated with the emplacement of the formerly molten rocks of the batholith has long since dissipated, as the youngest of the rocks have been dated at approximately 80 million years.

Cenozoic volcanism in the vicinity of the study area is mainly from three episodes: (1) Tertiary occurrences of widespread basaltic volcanism in the high Sierra, (2) early Quaternary episode of emplacement of intermediate to basic volcanic rocks in the eastern Coso area, and (3) later Quaternary emplacement of Pleistocene to Holocene basalts and rhyolites in the central and western Coso area. Some of the youngest of these are rhyolite domes dated at 41,000 ± 21,000 years (Lanphere and others, 1975).

There are no outcrops of volcanic rocks mapped within the confines of the WSA. The nearest outcrops are those of Tertiary volcanic rocks that lie west and northwest of the study area in Townships 22, 23, and 24 South, Range 35 East, MDB&M. The nearest of these is a body of olivine basalt, of probable Miocene age, that crops out just west of the central part of the western boundary of the area.

Both of the episodes of emplacement of younger Quaternary volcanic rocks, the only ones that might be expected to be associated with geothermal resources, resulted in nearest occurrences in the Coso area, which is separated from the study area by a distance of at least 9 miles, and also by the Sierra Nevada fault zone. Holen (1978), in his study of the geology of the Coso area, has shown that the outer limits of anomalous heat flow and ground temperature at Coso do not even approach the Sierra Nevada fault, as a western boundary, but instead, terminate nearly 10 km to the east. Even if a subsurface channel was present to carry the geothermal fluids from the main Coso thermal area to the west, it is likely that the Sierra Nevada fault and range front would act as effective barriers to their movement toward the study area.

Surface Evidence

There are no hot or warm springs or other surface phenomena such as fumeroles known in the study area. Only one instance of rock alteration that might be taken for secondary or hydrothermal alteration occurs in the area, at the extreme southern boundary, but this is believed to be the result of deuteric effects and not an indication of recent thermal activity. One significant fault, about 1.5 miles in length, occurs in the central part of the area; however, no springs are known to occur along its trace, and there is no evidence that it serves as a conduit for the deep circulation and thus heating by normal gradient of meteoric waters.

Geophysical Evidence

The Sierra Nevada physiographic province has been shown to have the lowest heat flow of any province within the contiguous United States (Diment and others, 1975). By contrast, the Basin and Range Province, which abuts the Sierra Nevada on the east and which contains the Coso Hot Springs area, is an area of highest heat flow. Although there are no heat-flow measurements known within the confines of the study area, the U.S. Geological Survey, as part of its regional heat-flow studies in the fall of 1983, ran a line from the Coso area to Lake Isabella. The data from the study have not yet been released, but preliminary evaluation of drill holes at Kennedy Meadows, located immediately north of the WSA, indicate no more than normal heat flow for the area and thus no geothermal potential (P. Galanis, personal communication).

The Bakersfield sheet of the Gravity Map of California (Hanna and others, 1975) shows a significant gravity anomaly in the northeast part of the study area in the vicinity of Chimney Peak. Such anomalies have, in some instances, been shown to be associated with geothermal occurrence. However, Hanna (1975) attributes that positive anomaly to the fact that the body of pre-Cretaceous metamorphic rock in the area is of higher density than the surrounding granitic rocks. An alternate theory has been presented by Jachens (1983), who attributes the entire anomaly to the trend of the Sacatar Quartz Diorite which comes down from the northwest. In any case, the anomaly does not appear to be related to subsurface structures favorable for geothermal resources. The geophysics portion of this report contains a more complete account of the interpretations of this anomaly.

Reservoir Rocks

Rocks in the study area are mainly granitic intrusives with minor metamorphic roof pendants, and have very low porosity and permeability. Although these rocks, in many parts of the area, are extensively fractured and jointed and, in some instances, contain open joints near the surface, these tend to diminish downward until at a depth of one-half mile or less the fracture porosity becomes extremely low. This means that even if a significant thermal anomaly could be discovered in the area, the lack of an adequate body of permeable reservoir rock in which to tap the contained thermal fluids makes economic development by conventional drilling techniques infeasible.

Summary and Conclusions

The Rockhouse Basin WSA has low or no geothermal potential. Within the boundaries of the study area, there are no occurrences of volcanic rocks; the nearest outcrops within the general region are of basaltic rocks of probable Miocene or Pliocene age that occur outside the study area on the west. These were erupted from centers too small, too dispersed, and now too old to have a significant effect or to contribute to the present near-surface geothermal regime. The nearest occurrence of younger shallow silicic magma chambers is at Coso, more than 9 miles to the east and separated from the Rockhouse Basin WSA by the Sierra Nevada frontal fault zone. Conductive heat flow or other means of transport from this source would be insufficient to cause a significant increase in surface heat flow within the study area. Test holes drilled near the northern boundary of the study area as part of the U.S. Geological Survey's heat flow studies have shown only the normal low heat values for the Sierran block and do not indicate the presence of any geothermal resource. Geophysical data, in the form of a sizeable positive gravity anomaly in the northern part of the WSA, apparently do not provide any evidence for the presence of geothermal resources in the WSA but instead have been interpreted as an indication of expected differences in rock densities.

Both the porosity and the permeability of Sierran basement rocks are extremely low, and are primarily limited to fractures. This means that even if an undiscovered heat anomaly existed there would be an insufficient reservoir volume to make economic development of any thermal fluids feasible.

Available evidence suggests that the Rockhouse Basin WSA has low or no geothermal potential.

OIL AND GAS RESOURCE POTENTIAL

by

Charles Bishop

The Rockhouse Basin WSA is not considered to have any potential for the discovery of oil and gas resources (Scott, 1983). The area is underlain by Mesozoic granitic intrusives and Paleozoic/Mesozoic metamorphic rocks that are incompatible with the generation and/or retention of hydrocarbon resources.

EVALUATION OF RADIOMETRIC DATA

by

Marjorie M. Bushnell

Airborne radiometric surveys, stream and water data, and prospect-examination reports of the U.S. Department of Energy were examined and interpreted for the Rockhouse Basin Wilderness Study Area (WSA). These National Uranium Resource Evaluation (NURE) data indicate modest uranium enrichment in the southwestern end of Long Valley and lesser enrichment at two other locations within the WSA. Areas adjacent to the WSA were included in the evaluation because they represent source rocks for possible placer deposits within the area and because favorable environments found may identify similar environments within the area.

Radiometric Survey

According to the Airborne Gamma-ray Spectrometer and Magnetometer Survey (U.S. Department of Energy, 1980), gamma-ray emissions for most portions of the Rockhouse Basin WSA are average when compared with the rest of the Bakersfield Quadrangle. Three contours of these data (at negative, zero, and positive anomalies) are shown on Figure 3, on which the positive areas are stipled. A small portion is below average in uranium, while three areas have small, positive anomalies. However, none of these positive areas within the WSA compares in strength to an area outside the WSA a few miles to the west along Taylor Creek or to the Isabella uraniferous area north of Kernville.

All of the WSA is low in thorium (also in contrast to the Isabella area), and also low to moderate in potassium. Some uraniferous areas immediately outside the study area correlate well with high-potassium counts, but within the study area, including Long Valley, potassium is only moderately enriched, and the correlation with uranium is irregular. The small amount of thorium present may be due to derivation from a nonigneous rock source, possibly a metasedimentary rock having a substantial carbonate component.

Because the flight lines for the NURE study were at three-mile intervals, these contours are highly generalized. Differences in gamma-ray response throughout the area may be due to a number of ancillary causes in addition to local variation in rock type. The strongest anomaly, at the southwestern end of Long Valley, may be the result of abundant pegmatite dikes containing allanite as a minor component and the presence of deuteric alteration in that area (see Heavy Mineral Examination section).

Prospect Report

A U.S. Atomic Energy Commission report (1956) describes a uranium and thorium-bearing pegmatite in section 11, T24S, R35E, MDB&M, near the study area, which includes rock types found abundantly in the study area. A discovery pit at this location (the John Thomas Claims) was tested at 30 times background radiation (total gamma). Uranium and thorium minerals were observed as fracture fillings and disseminated in pegmatite.

Thirty-four sediment samples from within and very near the study area are located on Figure 3. Three of these, all outside the study-area boundary, contain more than five parts per million (ppm) uranium, the richest of which contain 10.6 ppm. Uranium and thorium data from the study are presented in Table 3.

Although this generalized NURE radiometric study does not rule out the possibility of a localized concentration of radioactive minerals, it does suggest that the potential for finding such a deposit in the WSA is low to moderate, and that the WSA is substantially less radioactive than the surrounding terrain.

Table 3. Stream-sediment samples with uranium and thorium data.

Sample	Latitude	Longitude	Uranium ppm	Thorium ppm
001	35.764	118.082	3.83	23
002	35.783	118.082	2.37	7
003	35.790	118.067	4.40	19
004	35.817	118.053	3.87	13
005	35.816	118.081	3.76	10
006	35.825	118.109	3.34	16
007	35.836	118.045	4.31	12
008	35.840	118.025	4.84	14
009	35.853	118.029	2.75	6
010	35.868	118.013	4.74	13
011	35.893	118.001	4.74	10
012	35.753	118.108	2.21	10
013	35.877	118.034	10.59	42
014	35.884	118.058	2.63	13
015	35.911	118.077	2.94	20
016	35.873	118.082	2.94	4
017	35.898	118.113	1.90	10
018	35.987	118.132	1.87	7
019	35.889	118.146	3.56	6
020	35.865	118.129	1.55	7
021	35.846	118.150	1.91	5
022	35.834	118.129	1.97	5
023	35.895	118.031	3.58	30
024	35.919	118.041	4.67	28
025	35.942	118.060	4.36	18
026	35.951	118.086	1.76	15
027	35.979	118.089	5.88	10
028	35.999	118.101	3.11	10
029	35.965	118.104	3.88	19
030	35.892	118.185	7.45	24
031	35.908	118.173	2.58	4
032	35.926	118.154	2.31	16
033	35.949	118.163	3.59	14

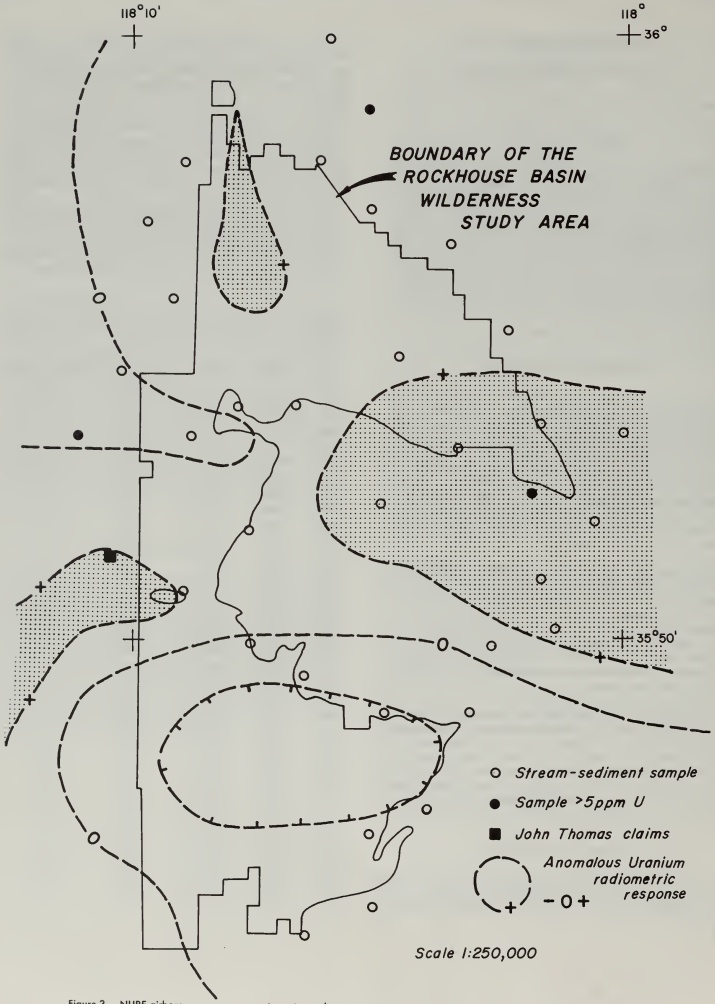


Figure 3. NURE airborne gamma-roy spectrometer and magnetometer survey of the Rockhouse Basin Wilderness Study Area.

GEOPHYSICAL STUDIES AND EVALUATION

by

R.H. Chapman

Introduction

Magnetic and gravity surveys have been found useful for studies of the geology and for evaluation of mineral resources in parts of the Sierra Nevada in California (Henderson and others, 1966; Oliver, 1982; Jachens, 1983). Magnetic data reflect variations in the magnetic properties of rocks; these variations are related, in turn, to the distribution of magnetic minerals, principally magnetite. Gravity data indicate lateral density variations in the rocks underlying an area.

Magnetic and gravity data can be used to extend the geologic mapping in some areas because different types of rocks are often characterized by different magnetic and/or density properties. These data are especially useful for locating contacts or faults in areas covered by alluvium and other surficial rocks, to determine the dip of contacts and the configuration of subsurface masses, and also to help locate areas favorable for mineral deposits.

Two aeromagnetic surveys of the Rockhouse Basin WSA were available for this study (U.S. Geological Survey, 1982, and NURE airborne survey, 1980). In addition to the aeromagnetic surveys, two ground magnetometer lines, totalling about 7-½ miles in length, were obtained during this study in order to provide more detailed information on local magnetic anomalies in the area. A regional gravity map of the Bakersfield AMS sheet that includes the Rockhouse Basin area is also available (Hanna and others, 1975).

Aeromagnetic Data

Plate 2 is an aeromagnetic map of the Lamont Peak 15-minute quadrangle taken from an aeromagnetic map of a larger area published by the U.S Geological Survey (1982). This map was compiled from data obtained at a flight elevation of 9,000 feet along east-west lines spaced at an interval of approximately one-half mile. After removing the International Geomagnetic Reference Field (IGRF) for the year of the survey from the data, the results were contoured at an interval of 20 gammas (nanoteslas).

Plate 2 shows an irregular pattern of aeromagnetic anomalies in the Rockhouse Basin area with anomalies up to about 500 gammas in amplitude. The anomaly pattern has a general northwest trend, but locally some anomalies have other trend directions.

Measured values of magnetic susceptibility of rock samples from the Rockhouse Basin area (Table 4) indicate that these rocks vary from weakly to strongly magnetic. A sample of Summit Gabbro has the highest value of magnetic susceptibility measured in the area (4,133 x 10^{-6} cgs units). Samples of Sacatar Quartz Diorite show a wide range of values of magnetic susceptibility (48 x 10^{-6} to 1,306 x 10^{-6} cgs units), thus this rock may vary in magnetic properties from weak to strong. The one sample of Isabella Granodiorite has a moderate value of magnetic susceptibility (620 x 10^{-6} cgs units). Samples of the rocks from the Kernville Series have generally low values of magnetic susceptibility (below about 100 x 10^{-6} cgs units) except for one sample of a magnetite-bearing schist that has a value of 1,850 x 10^{-6} cgs units. These values are in general agreement with the values obtained by Jachens (1983) for similar rocks in the area immediately to the west.

The measured variations in magnetic properties probably can account for the anomalies shown on Plate 2. Because the topography of the Rockhouse Basin area is moderately rugged, the magnetic map (Plate 2) is also affected by variations in the distance between the flight elevation (9,000 feet) and the topographic elevations where magnetic rocks are present. For example, magnetic rocks on a hilltop or ridge relatively close to the flight path will produce larger anomalies than similar rocks present in a depression or valley. Therefore, some "anomalies" on Plate 2 may be partly or largely the effects of the topography.

Table 4. Magnetic susceptibility of samples of rocks from the Rockhouse Basin area.

Rock Type	No. of Samples	Range of Values	Average Magnetic Susceptibility (cgs units x 10^{-6})
Isabella Granodiorite	1	—	620
Sacatar Quartz Diorite	3	48-1306	818
Mafic dike rock	1	—	69
Summit Gabbro	1	—	4133
Kernville Series Schist and metasediments	2	11-53	32
Greenstone/amphibolite	1	—	72
Magnetite schist	1	—	1850

Interpretation of Aeromagnetic Anomalies

ANOMALIES ASSOCIATED WITH THE SUMMIT GABBRO

The most prominent magnetic feature in the Rockhouse Basin area is an approximately linear northwest-trending series of positive anomalies located in the east-central part of the map sheet (marked "1" on Plate 2). This series of anomalies consists of four closures that extend northwestward a distance of about 6 miles from a point south of Chimney Peak, and one closure northeast of the main trend centered at a point just south of Big Pine Meadow. The amplitudes of these anomalies range from about 100 gammas to over 500 gammas. Most of these anomalies are closely associated with an area shown on the geologic map (Plate 1) as Summit Gabbro. The magnetic susceptibility of one sample of Summit Gabbro was found to be 4,133 x 10^{-6} cgs units (Table 4), which indicates that this rock is highly magnetic. The southeasternmost anomaly of the series, located south of Chimney Peak, is associated with an area mapped as Sacatar Quartz Diorite. This anomaly suggests the possible presence of additional Summit Gabbro at depth in this geologic unit, although locally mafic facies of the Sacatar Quartz Diorite also might be sufficiently magnetic to cause the anomaly.

A steep magnetic gradient on the northeastern side of anomaly "1" marks the contact shown on the geologic map (Plate 1) between Summit Gabbro (and Sacatar Quartz Diorite, to the south) and the Isabella Granodiorite. The location of this gradi-

ent indicates that the contact probably has a steep dip. On the southwestern side of anomaly "1," however, a steep magnetic gradient is located near the contact between Summit Gabbro (and Sacatar Quartz Diorite) and the Kernville Series rocks only at the southern and northern ends of the anomaly. In the central part of the anomaly, the steep gradient is located as far as 4,000 feet west of the contact, well within the metamorphic rocks. This steep gradient probably marks a contact between Summit Gabbro and Sacatar Quartz Diorite, although not all of the gabbro is exposed. The presence of the steep magnetic gradient within the Kernville Series rocks indicates that the igneous rocks underlie the metamorphic rocks at a relatively shallow depth along the eastern side of the roof pendant.

A part of a very prominent circular positive magnetic anomaly with an amplitude of about 500 gammas is located near the northern border of the map sheet in the vicinity of Kennedy Meadows (marked "7" on Plate 2). The geology of this area is not included on Plate 1, but the anomaly probably is caused by relatively magnetic basic igneous rocks, possibly Summit Gabbro, as shown on the Bakersfield sheet of the Geologic Map of California (Smith, 1965).

ANOMALIES ASSOCIATED WITH THE KERNVILLE SERIES

Outcrops of rocks of the Kernville Series extend southeastward from the northwestern part of the Rockhouse Basin area to the vicinity of Lamont Meadow (Plate 1). This area is characterized by a general magnetic low (marked "2" on Plate 2), as might be expected from the low measured values of magnetic susceptibility for these rocks given in Table 4. Within this broad magnetic low there is a relatively narrow, northwest-trending positive anomaly having a total length of about 4 miles and a maximum amplitude of about 100 gammas (marked "3" on Plate 2). Most of this anomaly is located outside of the boundary of the Rockhouse Basin Wilderness Area, but it may extend a short distance into the central part of the area. This anomaly was investigated on the ground, and it will be discussed in more detail in the section on Ground Magnetic Data.

ANOMALIES ASSOCIATED WITH THE SACATAR QUARTZ DIORITE

There are a number of magnetic anomalies located over rocks mapped as Sacatar Quartz Diorite in the map area. One of these is an east-trending anomaly with an amplitude of about 80 gammas, centered about 1.5 miles east of Rockhouse Basin (marked "4" on Plate 2). This anomaly may be partly related to ridge crests in the area, but it apparently crosses a valley area also. The anomaly may represent a relatively mafic portion of the Sacatar Quartz Diorite.

The anomaly marked "6" on Plate 2 consists of three positive closures that trend just south of east from a point east of White Dome across Long Valley, a total distance of about 5 miles. From the west, the first two closures have amplitudes of about 100 and 50 gammas, respectively, and both anomalies are associated with areas of high terrain. These anomalies probably represent relatively mafic parts of the Sacatar Quartz Diorite. The easternmost anomaly of the series is also associated with a ridge crest, but it is smaller in area and located close to the contact between the quartz-diorite and the Kernville Series. The amplitude of this anomaly is about 60 gammas. The cause of this anomaly is not known, but it could be either a relatively magnetic part of the Sacatar Quartz-Diorite, or magnetite-bearing rocks within the Kernville Series close to the contact with the igneous rocks.

ANOMALIES ASSOCIATED WITH THE ISABELLA GRANODIORITE

Anomalies associated with exposures of Isabella Granodiorite in the Rockhouse Basin area are usually small to moderate in amplitude. This indicates that most of the Isabella Granodiorite in this area is relatively less magnetic than the other igneous rocks.

One anomaly apparently associated with Isabella Granodiorite is located about 3 miles north of Chimney Peak. It trends just west of north and has an amplitude of about 50 gammas (marked "5" on Plate 2). This anomaly is associated with a ridge having the same trend.

Other anomalies associated with the Isabella Granodiorite include a very broad northeast-trending magnetic high, with an amplitude of about 100 gammas, located in the southwestern part of the area, just south of the Tulare-Kern County line (anomaly "8" on Plate 2) and an east-trending positive anomaly with an amplitude of about 60 gammas in the southeastern part of the map area (marked "9" on Plate 2). Both of these anomalies are associated with areas of high topography and ridges that have the same trends as the anomalies.

Ground Magnetic Data

The locations of the two ground magnetic profiles and the profiles themselves are shown on Plate 2. These profiles were run to obtain detailed information, on some of the anomalies mapped in the aeromagnetic survey, readings were taken on 300-foot spacings. Line 1 (Plate 2) extends generally eastward along a trail from the northern end of Long Valley to a point northwest of Chimney Peak, a distance of about 4.4 miles. Line 2 (Plate 2) extends generally just east of north from a point about three miles northwest of Lamont Meadow to the intersection with Line 1, northwest of VABM Bear, a distance of about 3.8 miles. The ground magnetometer profiles cross exposures of rocks of the Kernville Series, the Sacatar Quartz Diorite, and the Summit Gabbro. In general, the profiles show relatively low magnetic values over rocks of the Kernville Series and higher, somewhat irregular, values over the igneous rocks, as might be expected from the measured values of magnetic susceptibility of rock samples (Table 4). Contacts between the metasedimentary rocks and the igneous rocks on these profiles are usually marked by sharp changes in magnetic values (more positive over the igneous rocks).

The pronounced magnetic high shown by the first three stations on the south end of Line 2 may represent a part of the aeromagnetic anomaly shown just south of this point on Plate 2 (anomaly "6"). This anomaly is close to the contact between the Kernville Series and the Sacatar Quartz Diorite and could represent either a relatively magnetic phase of the quartz diorite or a magnetic unit near the border of the roof pendant. The relatively broad magnetic high that has a maximum amplitude of about 1,000 gammas just east of station 50 on Line 1 is over Sacatar Quartz Diorite on the section. However, this anomaly is located just south of outcrops of Summit Gabbro (Plate 1) which probably cause this anomaly.

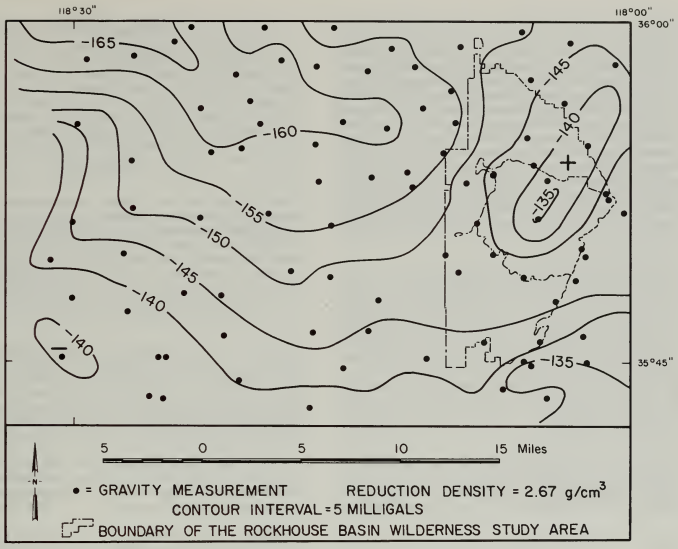


Figure 4. Bouguer gravity map of the Rockhouse Basin Wilderness and adjacent area.

A relatively sharp magnetic high centered near station 19 on Line 2 has a local amplitude of about 1,500 gammas and a ground width of about 1,000 feet. This anomaly corresponds to anomaly "3" on Plate 2. The anomaly source is evidently within the Kernville Series. The same anomaly may be present on Line 1 near station 16, where it is represented by a small magnetic high (amplitude about 300 gammas) and an associated magnetic low.

In order to study the local magnetic anomaly that evidently originates from a source in the Kernville Series, a profile was drawn from the aeromagnetic data (A-A', Plate 2) near the area where Line 2 crosses the anomaly on the ground. A residual magnetic anomaly was then obtained by removing an assumed regional magnetic trend. The resulting anomaly has an amplitude of about 100 gammas.

An examination of the residual anomaly (Plate 2) indicates that the top of the anomalous mass probably is close to the ground surface. The ground magnetic profile (Line 2, Plate 2) shows that the width of the anomalous mass is about 1,000 feet. Using these parameters, and an arbitrary depth extent for the mass of 2,000 feet, a model for the magnetic source was constructed and a theoretical anomaly calculated for comparison with the observed anomaly (Plate 2). A magnetic susceptibility contrast of approximately 0.028 cgs units was found necessary to account for the anomaly with the assumed model. One sample of a magnetite-bearing schist taken from near the anomaly was found to have a measured magnetic susceptibility of 0.0185 cgs units (Table 4). The agreement between the calculated value of magnetic susceptibility and that of the one measured sample is only fair, but measurements on additional samples would be necessary to obtain a reasonable average value. Judging from the one sample, however, the schist is strongly magnetic, and it is possibly the cause of the observed anomaly.

Regional Gravity Data

Figure 4 is a portion of the Bouguer gravity map of the Bakersfield sheet that includes the Rockhouse Basin area (Hanna and others, 1975). This map has a contour interval of 5 milligals (mgal), and it shows the broad regional gravity features of the area. No detailed gravity maps are available within the study area.

Figure 4 shows two major gravity anomalies: (1) a broad regional negative anomaly that trends just south of east from the northwestern corner of the map, and (2) a positive anomaly with a northeast trend and an amplitude of about 15 mgal, centered in the eastern part of the Rockhouse Basin area. The negative anomaly may represent the regional gravity low associated with the Sierra Nevada (Hanna and others, 1975, p. 4). The small positive closure near the southwestern end of the main positive anomaly is centered over rocks of the Kernville Series. The positive anomaly has a northeast trend, however, in contrast to the northwest trend of the roof pendant rocks. This anomaly could be caused, at least in part, by the metamorphic rocks, if they are sufficiently dense in comparison with the adjacent igneous rocks. However, no density measurements have been made for samples of these rocks.

In a study of the adjacent Domelands Wilderness area, Jachens (1983) showed that the positive gravity anomaly in the Rockhouse Basin area is a part of a larger positive anomaly that is centered north of this area. Jachens concluded that the anomaly probably is caused primarily by a mass of Sacatar Quartz Diorite within the Isabella Granodiorite. Samples of the quartz diorite and granodiorite were found to have average densities of about 2.83 g/cm^3 and 2.63 g/cm^3, respectively. The anomaly in the Rockhouse Basin area may also be caused, in part, by the Summit Gabbro, which probably has a density greater than that of the quartz diorite.

If the positive gravity anomaly is caused by units of the Sacatar Quartz Diorite and Summit Gabbro, these rocks must extend beneath surface exposures of granodiorite for a distance of at least about 4 miles northeast of the Rockhouse Basin area.

Conclusions

Aeromagnetic and ground magnetic data show many prominent anomalies associated with igneous rocks in the Rockhouse Basin area. The largest magnetic anomalies in the area apparently are associated with exposures of Summit Gabbro, but other anomalies are associated with both the Sacatar Quartz Diorite and Isabella Granodiorite. The anomalies in the aeromagnetic survey also often correspond to ridge tops and areas of high elevation that are relatively close to the elevation of the magnetic survey.

One magnetic anomaly is clearly associated with the metamorphic rocks of the Kernville Series. Aeromagnetic and ground magnetic data were used to develop an approximate model for the source of this anomaly. This model requires a magnetic susceptibility contrast of about 0.028 cgs units to match the observed anomaly. One sample of a magnetite-bearing schist taken from a point near the anomaly on the ground was found to be strongly magnetic (magnetic susceptibility of 0.0185 cgs units). Thus, this type of rock may be the source of the anomaly.

Although most of the magnetic anomalies in the Rockhouse Basin area are associated with igneous rocks, and one anomaly is apparently caused by magnetite-bearing schist, some of the smaller anomalies such as the southeastern part of anomaly "6" on Plate 2 could represent concentrations of magnetic minerals that might have commercial importance. Additional ground investigations would be necessary to evaluate these anomalies.

Regional gravity data suggest that relatively dense rocks are present in the subsurface north and east of the Rockhouse Basin area. These dense rocks probably consist of Sacatar Quartz Diorite and possibly Summit Gabbro.

GEOCHEMICAL, HEAVY MINERAL, AND PETROGRAPHIC STUDIES

by

John T. Alfors, Ralph C. Loyd,
Melvin C. Stinson, and Michael A. Silva

Geochemical Survey

The main objective of the geochemical survey was to identify areas that possibly contain undiscovered or concealed mineral deposits that might be economically exploited in the future. Six-hundred forty-eight stream sediment samples from 294 sample localities were collected and then analyzed and evaluated in terms of their elemental abundance and geologic environment. The sample locations are shown on Plate 3.

SAMPLING AND ANALYTICAL PROCEDURES

Sediment samples were taken from all the major streams and tributaries, including some samples from streams outside the study area that headed within the study area. Two samples were collected at each of 294 sample sites (Plate 3). One sample, weighing between 1 and 20 pounds, was collected and later dried and sieved, and a 100 gram or larger fraction finer than 80 mesh (minus 0.18mm) was retained for analysis. Each sample was composited from active alluvium collected from several locations within an area that may extend as much as 100 feet from the site plotted on the map. The other sample was a heavy mineral concentrate that was concentrated, where possible, by panning at the site.

Several hundred rock samples were collected for petrographic examination, and of these, 13 were chemically analyzed (sample No. 165-177, Plate 3 and Appendix G-1). These came from claims, prospects, and other obviously mineralized areas.

All the geochemical samples were analyzed for 30 elements (Table 5) by inductively coupled argon plasma emission spectrometry (ICP). In addition, splits of the heavy mineral concentrate samples were analyzed for gold by a combination fire assay and atomic absorption technique. A total of 20,146 individual elemental determinations were made. The analyses were made by Acme Analytical Laboratories Ltd., Vancouver, British Columbia. For the ICP analyses, a 0.5 gram sample was digested with 3 ml of 3:1:3 HCl to HNO_3 to H_2O at 90 degrees C for one hour. The sample was then diluted to 10 ml with water. This leach is partial for: Ca, P, Mg, Al, Ti, La, Na, K, W, Ba, Sr, Si, Cr, and B. The minus 80 mesh samples were digested without pulverizing; the nonmagnetic panned concentrates were pulverized to minus 100 mesh before digestion. The gold analyses used a 10-gram sample in which the gold was concentrated by fire assay into a silver bead. The silver was leached off by HNO_3 then the residue was digested by aqua regia. The analysis was by graphite atomic absorption.

Because of the sampling procedures used, the analyses do not represent true assay values. For example, in order to accumulate 100 grams of heavy mineral concentrate, it was necessary to take 20 or more pans of stream sediment at some sample sites. At other sample sites, one pan provided 100 grams of heavy mineral concentrate. A level-full standard gold pan holds about 20 pounds of sand and gravel (Wells, 1973, p. 89). To pan this down to 100 grams of heavy mineral concentrate represents a 90-fold concentration. If 20 panfuls are needed to accumulate 100 grams of heavy mineral concentrate, this represents an 1800-fold concentration of the original stream sediment. The analyses, nonetheless, are useful for reconnaissance exploration purposes; however, more quantitative sampling techniques would have to be used for evaluations of the economic potential of individual sample sites. Although all the geochemical data were reviewed and evaluated during the resource appraisal, only those data considered to indicate anomalous element concentrations or otherwise considered to be essential to discussion of the resource appraisal are presented in this report. The results of all the analyses are given in Appendix G-1. In addition, all the geochemical analytical data have been entered on nine-track magnetic tape.

Table 5. Elements determined by inductively coupled argon plasma emission spectrometry and their lower limits of determination (ppm).

Aluminum	100	Magnesium	100
Antimony	3	Manganese	1
Arsenic	3	Molybdenum	1
Barium	10	Nickel	1
Bismuth	3	Phosphorus	10
Boron	3	Potassium	100
Cadmium	1	Silver	0.1
Calcium	100	Sodium	100
Chromium	1	Strontium	1
Cobalt	1	Thorium	3
Copper	1	Titanium	100
Gold*	3	Tungsten	3
Iron	100	Uranium	3
Lanthanum	3	Vanadium	3
Lead	1	Zinc	1

*Gold was also determined by a method combining fire assay with atomic absorption and the lower limit of determination by this method was 5 ppb.

STATISTICAL ANALYSES OF GEOCHEMICAL SAMPLES

Stream-sediment samples represent a composite of the material upstream from the sample site and, therefore, each one can represent a considerable drainage area. Stream-sediment sampling can be an effective and rapid method of mineral exploration, inasmuch as anomalous quantities of elements in the sediment may signal the occurrence of concealed or unknown deposits of prospecting interest (Huber and others, 1982, p. 22). Stream-sediment geochemistry can be a direct means of excluding territories of little mineral potential from those areas with more than average mineral potential. The absolute chemical values for the samples are not so important as are anomalies with reference to the overall drainage area and the geologic environment.

Two different approaches were used for evaluating the geochemical data. For gold, all amounts at or above the limit of detection were considered anomalous. For the other elements, all data were statistically analyzed in an attempt to determine what might be the expected distribution for individual elements in the entire data set and to establish a threshold value for data to be considered anomalous. Values two standard deviations greater than the geometric mean were designated as anomalous. The setting of threshold values at two standard deviations above the mean was chosen because, for a normally distributed population,

most of the significant anomalies would be included, and only a small proportion of the background population would be included. The samples did not contain an appreciable proportion of ore-related samples which would leave distorted the population distribution, and thus have made the two-standard deviation approach inappropriate. The mean values were comparable to that of granitic rocks in the Sierra Nevada, and worldwide granodiorites. Tables 6 and 7 list the threshold values for the elements of primary interest.

Table 6. Elements used for the selection of anomalous samples, their threshold values, and numbers and percentages of samples at or above threshold. All samples are minus 80 mesh stream sediment samples except as noted.

Element	Analytical Method	Lower Limit of Detection (ppm)	Threshold Value (ppm)	Anomalous Samples Total Number	Anomalous Samples Percent of Samples analyzed
Antimony	ICP	3	3	17	5.1
Arsenic	ICP	3	11	18	6.0
Barium	ICP	10	329	12	3.9
Copper	ICP	1	82	10	3.3
Gold*	FA/A-A	0.005	0.005	26	8.2
Lead	ICP	1	16	11	3.9
Manganese	ICP	1	1045	6	1.8
Molybdenum	ICP	1	3	6	1.8
Phosphorus	ICP	10	2400	15	5.1
Silver	ICP	0.1	0.3	15	4.2
Thorium	ICP	3	72	11	3.3
Tungsten	ICP	3	6	3	0.9
Uranium	ICP	3	11	15	4.8
Zinc	ICP	1	116	5	1.5

* Heavy mineral concentrate sample

Table 7. Elements used for the selection of anomalous samples, their threshold values, and numbers and percentages of samples at or above threshold. All samples are heavy mineral concentrates.

Element	Analytical Method	Lower Limit of Detection (ppm)	Threshold Value (ppm)	Anomalous Samples Total Number	Anomalous Samples Percent of Samples analyzed
Antimony	ICP	3	3	17	5.1
Antimony	ICP	3	47	1	0.3
Arsenic	ICP	3	18	12	3.8
Barium	ICP	10	800	17	5.4
Copper	ICP	1	51	18	5.8
Gold	FA/A-A	0.005	0.005	26	8.2
Lead	ICP	1	153	5	1.6
Manganese	ICP	1	736	15	4.8
Molybdenum	ICP	1	6	8	2.6
Phosphorus	ICP	10	2600	12	3.8
Silver	ICP	0.1	0.5	7	2.2
Thorium	ICP	3	1770	15	4.8
Tungsten	ICP	3	166	12	3.8
Uranium	ICP	3	183	17	5.4
Zinc	ICP	1	80	5	1.6

The SAS UNIVARIATE procedure (SAS Institute, 1982, p. 575-593) was the statistical package used in the evaluation of the geochemical data. The statistical data produced by the SAS UNIVARIATE procedure for all 30 elements analyzed by ICP for both minus 80 mesh stream sediment samples and heavy mineral concentrate samples and the statistical data for the gold analyses of heavy mineral concentrate samples by a combination fire assay and atomic absorption methods are given in the Appendix. The magnetite in the heavy mineral concentrate samples had been removed with a hand magnet before analysis. The portion of the heavy mineral concentrate samples analyzed for gold by fire assay and atomic absorption procedures did not have the magnetite removed.

The "anomalous" threshold values from the ICP analyses of the panned heavy mineral concentrate samples are shown on Table 7. However, it is difficult to compare the analytical results of pan concentrates due to differences in "degree of panning" from place to place; that is, a little extra panning immediately enhances an anomaly. For example, sample H-50 required 25 panfuls to accumulate 100 grams of heavy mineral concentrate. This is more than a 2,000-fold concentration of the original sample. The amount of gold in the concentrated sample was 1,650 ppb; therefore, this represents about 0.8 ppb in the original sample or a monetary value of about one cent per ton of unconcentrated stream sediment based on $400 per ounce for gold.

Inasmuch as the majority of the Rockhouse Basin Wilderness Study Area is underlain by granitic rocks (Isabella Granodiorite and Sacatar Quartz Diorite), it is of interest to compare the geometric mean values determined for the minus 80 mesh stream sediment samples with the average values for Mesozoic plutonic rocks of the Sierra Nevada (Dodge, 1972, Table 1) and granodiorites worldwide (Levinson, 1980, Table 2-1). Mean values for the heavy mineral concentrate samples are also given. In Table 8 such a comparison is presented. Most of the mean values for the trace elements in the Rockhouse Basin stream sediments are in close agreement with the averages of Mesozoic plutonic rocks from the Sierra Nevada, and the averages for granodiorites worldwide. Antimony is the only element in the Rockhouse Basin samples that is one order of magnitude higher than in granodiorites worldwide. Arsenic and thorium values are about twice as high in the Rockhouse Basin samples than the average values for the plutonic rocks of the Sierra Nevada and granodiorites worldwide. The mean values for boron, barium, strontium, and titanium are almost one order of magnitude lower in the Rockhouse Basin samples than in those of the plutonic rocks for the Sierra Nevada and granodiorites worldwide. These differences are due to the fact that the digestion procedure used for the ICP analyses is only partial for boron, barium, strontium, and titanium. The digestion is partial for lanthanum, chromium, and tungsten as well. Both the lanthanum and chromium values are somewhat lower in the Rockhouse Basin samples than in the average plutonic rocks of the Sierra Nevada and granodiorites worldwide, but the tungsten values appear to be unaffected perhaps because of the low concentration.

The mean values for many of the minor elements in the minus 80 mesh and heavy mineral concentrate samples are surprisingly similar. There is less than a 50 percent difference between the mean values for the minus 80 mesh samples and heavy mineral concentrate samples for the following elements: Ag, As, B, Ba, Cr, Cu, Mn, Ni, Sr, and Zn. There is between a 50 and 150

percent difference for the following elements: Bi, Co, Mo, Pb, Sb, Ti, and V. The elements that show dramatic increases in mean values in the heavy mineral concentrates are Cd, La, Th, U, and W. No comparison could be made for gold between minus 80 mesh samples and heavy mineral concentrate samples because the detection limit for gold in the minus 80 mesh samples was too high. There was more than a 1000 percent increase in the mean values of Th, U, and W in the heavy mineral concentrate samples compared to the values in the minus 80 mesh samples. This is explained by the concentration of heavy minerals containing these elements, scheelite in the case of W and zircon and allanite for the Th and U. The heavy mineral barite is also concentrated in the panned concentrates, and Ba might have been expected to show a dramatic increase also. However, the digestion technique used for the analyses was only partial for barium, and this resulted in lower than actual values.

The fact that essentially all of the chalcophile elements (Ag, As, Cu, Mo, Ni, Pb, Sb, and Zn) show at most only moderate increases in the heavy mineral concentrates indicates that there are few sulfides in the samples. This was confirmed by binocular examination of the heavy mineral concentrate samples (see following section).

Table 8. Selected minor-element data, in parts per million, for minus 80 mesh steam sediment samples from Rockhouse Basin, average Mesozoic plutonic rocks in the Sierra Nevada, average granodiorites worldwide, and heavy mineral concentrate samples from Rockhouse Basin.

Element	Rockhouse -80 mesh samples (mean value)	Sierra plutonic rocks (average)[1]	Grano-diorites worldwide (average)[2]	Rockhouse heavy mineral concentrates (mean value)
Ag	0.12	—	0.07	0.17
As	5	—	2	7
Au	—	.0012	.004	.009
B	6	—	20	4
Ba	149	1000	500	154
Bi	2	—	—	4
Cd	0.1	—	0.2	1
Co	10	10	10	16
Cr	19	30	20	20
Cu	36	20	30	23
La	17	30	36	62
Mn	511	—	1200	475
Mo	1	—	1	2
Ni	11	10	20	10
Pb	8	20	15	21
Sb	2	—	0.2	4
Sr	51	500	450	38
Th	21	14.35	10	530
Ti	1354	—	8000	2566
U	4	4.34	3	53
V	91	100	100	161
W	2	—	2	34
Zn	67	—	60	41

[1] Dodge, 1972, Table 1
[2] Levinson, 1980, Table 2-1

Examination of Heavy Mineral Samples

Panned samples were collected from nearly 300 sites within the study area. Each sample of heavy minerals was carefully split into two parts: one for chemical analysis, and the other for microscopic examination. During the early part of the study, all samples (samples 1-58) were examined in succession. However, it became apparent that little new information could be obtained by examination of all samples. Thereafter, heavy mineral examinations were first made only for those samples whose chemically analyzed splits revealed anomalous elemental abundance of interest and later for selected samples in order to attain adequate coverage of the study area. In all, about 140 samples, or roughly half of the total, were examined (Plate 5, in pocket). The following procedure was followed during this study:

1. Samples were first checked for radioactivity using a geometrics model GR-101A gamma-ray scintillometer. The following classification was used: S1 - slightly radioactive, less than .02 mr; M - moderate, greater than .02 mr; most radioactive samples were only slightly radioactive, a few were moderately radioactive. Since the measurements could be made of unopened bag samples, all 300+ samples were eventually tested with the scintillometer (Table 9).

Table 9. Heavy mineral samples having measurable radioactivity. Measurement is slight (0.02mr) unless otherwise noted by M (Moderate: 0.02mr).

1		125		232		319	
2		126		233		321	
4		127		238		322	M
5		128		239		323	
11		129		240		324	
16	M	133		246		325	M
17RS		134		252		326	
22		139		253		327	M
23		140		258		328	
24		142		259	M	329	
27		143		261		331	M
35		145		262		332	M
36		146		263		398	
38		148		264		399	
47		149		266		406	
50		150		268		410	
52		151		273		416	
53		152		274		419	
54		154		276		421	
102		156		301		427	
104		157		302		429	
105		161		305		430	
108		207		306		434	
114		208		308	M	435	
115		214		309	M	443	
117		216		310		447	
118		217		311		448	
119		219		313		450	M
120		220		314		453	
121		221		316		456	
123		224		317		457	
124		228		318			

2. The magnetic fraction was removed with a small permanent magnet, examined with binocular microscope, and set aside. A rough estimate was made of the relative proportions of the magnetic and nonmagnetic fractions of the sample. Most of the magnetic fraction consisted of magnetite or titanium-bearing magnetite. Some magnetite partially altered to hematite, and ilmenite occurs in the magnetic fraction also. The remainder of the procedure involves the nonmagnetic fraction of this heavy mineral concentrate.

3. The color of the nonmagnetic fraction was noted. The sample was then spread out into a single-grain-layer and exam-

ined under short-wave ultraviolet light for the tungsten minerals scheelite and powellite, which fluoresce blue-white and yellow, respectively. Also of interest was zircon, which fluoresces orange. No other fluorescent minerals were noted. The following terms are used to indicate the abundance of fluorescent tungsten minerals: *c - common*, 7 or more grains; *r - rare*, 5 or 6 grains; *t+ - trace plus*, 3 or 4 grains; *t - trace*; 1 or 2 grains.

4. The sample was then examined with a binocular microscope, the minerals were identified, and an estimate of their relative abundance made using the following terms: *A - abundant* - The mineral makes up a large proportion of the sample, is easily identified, and is found throughout the sample; *C - common* - the mineral makes up a considerable proportion of the sample, but not as much as the abundant minerals, is easily identified, and found throughout the sample; *R - rare* - This mineral is clearly not as prevalent in the sample as minerals in the other two classifications, is identifiable, but not found throughout the sample, and makes up a minor proportion of the sample; *T - trace* - Minerals given this classification are only seen occasionally during the examination of the entire sample and may be as few as 1 in number. Note that symbols used to present relative mineral abundance determined by binocular microscope examination are upper case letters.

5. Several minerals of interest such as barite and apatite are extremely difficult to identify with a reasonable degree of reliability by examination with a binocular microscope. To aid in the identification of barite and apatite, a small amount (305 mg) of the extremely fine-grained portion of the sample was examined in refractive index oils using the polarizing microscope. Minerals identified by this method were given a relative abundance classification based upon the number of grains seen in one drop of oil placed upon a glass slide. A similar classification to that used for scheelite and powellite was used for the minerals identified with the polarizing microscope. This classification is as follows: *c - common*, 7 or more grains; *r - rare*, 5 or 6 grains; *t+ - trace plus*, 3 or 4 grains; and *t - trace*, 1 or 2 grains. This above classification (using lower case letters) is also used to show the relative abundance of all other minerals identified only with the polarizing microscope.

Results of the heavy mineral examination are presented in tabulated form on Table 10.

Petrographic Examinations

Petrographic examinations were made of five thin sections cut from samples collected from the study area. Two of the samples (#200 and #201) were collected from barite prospects. These were examined in order to help determine whether the barite deposits are of hydrothermal-type (epigenetic) or sedimentary-type (syngenetic) deposits. Results of the examination indicate that the barite deposits in the study area are sedimentary in origin.

Two metamorphic rock samples (#17 and LK) were examined to determine the mineralogy of porphyroblasts they contained. The examinations revealed that one sample (#17) was a metapelite that contained scattered porphyroblasts of kyanite. Kyanite has not been identified previously in this area. Sample LK, also a metapelite, contained muscovite-sericite pseudomorphs after andalusite (?). Both samples also contained fine-grained crystals of dravite-tournaline (?).

The fifth sample examined was collected from a contact metamorphic zone near a tungsten-molybdenum skarn deposit. The sample is identified as a augite-quartz hornfels. The original rock was probably dolomite or dolomitic limestone.

Hand sample and petrographic descriptions of these samples follow.

Sample A

Location: Kern-Sierra Dump SW-1/4 SW-1/4 NE-1/4 Section 30, T23S, R36E.

Hand sample description: unusual breccia-like rock composed of 5-10mm "spheroids" of fine-grained, green mineral floating in interstitial matrix of light-green to white fine-grained material. The sample contains minor pyrite and is rather heavy. It also appears to be high in silica content. Slightly obscured varve-like laminae that extend continuously across the "spheroids" and matrix indicate the original rock material was sedimentary (probably calcareous) which has undergone replacement under contact metamorphic conditions.

Petrographic Description: Thin section examination reveals the sample to be an *augite-quartz hornfels* containing minor amounts of amphibole (tremolite?) epidote, calcite, sphene, scheelite, and pyrite. Augite crystals rarely exceed 0.1mm; white quartz grains average about 1.0mm in diameter. Quartz is concentrated in 2-3mm thick laminae which alternate with augite layers ranging from 1-10mm in thickness.

Sample #200

Location: SW-1/4 SW-1/4 SW-1/4 Section 35, T23S, R36E.

Hand-Sample Description: White to gray, medium-grained rock with sugary texture. The sample has high specific gravity. A slight hint of bedding is suggested by mild coloration differences along bands averaging 10-20mm thick.

Petrographic Description: Thin section examination shows the rock sample to be composed predominantly of *barite*. The barite is present in a mozaic of tabular crystals measuring 1-2mm in length and 0.5-1.0mm in width. There appears to be a general preferred orientation of the crystals. Several thin, distorted, fine-grained quartz-rich laminae marked by limonite staining and containing some pyrite are present. Most barite crystals contain several small grains of quartz (0.3mm) as inclusions. No magnetite observed.

Sample #201

Location: SW-1/4 SW-1/4 SW-1/4 Section 35, T23S, R36E.

Hand Sample Description: Light- to dark-gray, bedded, medium-grained rock exhibiting sugary texture. Many void spaces (1-3mm) along some laminae. Laminae measure 1-10mm. The sample has high specific gravity.

Table 10. Tabulated list of relative mineral abundances in heavy mineral samples. Determinations made by binocular, refeactive index oil, and short-wave ultra-violet fluorescent light examinations.

SAMPLE NUMBER	PERCENT MAGNETITE	COLOR	QUARTZ-FELDSPAR	RADIOACTIVITY	ZIRCON	SCHEELITE	POWELLITE	BARITE	AFTER PYRITE HEMITITE-LIMONITE	HORNBLENDE	PYROXENE	BIOTITE	MUSCOVITE	CHLORITE	GARNET	ILMENITE	EPIDOTE-CLINOZOISITE	SPHENE	MONAZITE	APATITE	ALLANITE	RUTILE	TOURMALINE	REMARKS
1	80	y/gr	C	S1?	A	--	--	t+	--	A	--	C	--	--	R	T+	--	A	T	t	--	--	--	Hyperthene-t
2	80	y/gr	C	S1?	A	--	--	t+	--	A	T	C	--	--	R	T+	C	A	T	t	--	--	--	
3	85	bk/w	C	--	C	--	--	c	T	C	--	C	--	--	C	--	C	A	T	--	--	--	--	
4	40	gr/w	A	S1?	C	--	T	t	--	A	T	T	--	--	R	--	A	C	T+	--	--	--	--	
5	80	y/gr	C	S1	C	--	C	t	--	--	T	--	--	--	R	--	C	R	--	t	--	--	--	
6	80	y/gr	C	--	A	--	T	c	c	--	T	C	--	--	T	C	A	T+	T+	t	--	--	--	
7	20	gr/br	A	--	C	--	--	t+	--	C	C	C	--	--	--	--	C	C	--	t	--	--	--	
7RS	70	gr	C	--	R	t	--	t+	R	--	R	--	--	--	T	--	A	--	--	t	--	--	--	
8	40	y/gr	A	--	A	--	--	t	--	A	--	C	--	--	--	--	A	C	--	t	--	--	--	
9	80	y/gr	C	--	R	c	--	t	C	C	C	C	--	--	T+	R	C	--	--	t	--	--	--	
10	40	gr	C	--	C	t	--	--	T+	A	--	--	--	--	--	--	C	--	--	t	--	--	--	
11	50	gr	C	S1?	A	c	--	t+	C	A	R	C	--	--	C	R	C	A	--	t	--	--	--	
12	65	gr	C	--	R	t	--	t	T+	--	C	C	--	--	C	C	C	R	--	t	--	--	--	
13	50	gr/y	C	--	C	t	--	t+	T	C	C	C	--	--	C	C	R	C	--	t	--	--	--	
14	40	gr	A	--	C	t	--	t+	--	C	C	C	--	--	--	--	C	C	--	t	--	--	--	
15	40	gr	A	--	T+	--	c	c	C	C	--	--	--	--	C	--	C	C	--	t	--	--	--	
16	90	y	C	M	T+	c	--	t	--	--	--	T+	--	--	--	--	C	T	C	t	R	--	--	
17RS	70	y/gr	C	S1?	C	--	--	t+	T	C	--	C	--	--	--	--	C	T	t	t	--	--	--	Hematite
18	50	gr/bk	R	--	A	--	--	c	--	C	C	C	--	--	T	--	C	A	--	t	--	--	--	
19	60	gr/bk	C	--	A	--	--	t+	--	C	C	--	--	--	--	--	C	C	--	t	--	--	--	
20	80	bk/w	R	--	R	c	T	t+	C	C	--	C	--	--	C	--	C	C	--	t	--	--	--	
21	80	bk/w	A	--	C	c	--	c	--	C	C	C	--	--	C	--	C	C	--	t	t	--	--	
22	60	bk/w	A	S1	R	r	--	t	--	C	C	C	--	--	C	--	--	C	T	t	--	--	--	
23	85	bk/w	A	S1?	R	--	--	c	--	R	--	C	--	--	C	R	C	C	R	t	--	--	--	
24	60	bk/w	C	S1?	C	--	--	c	R	C	C	--	--	--	R	--	C	C	R	t	--	--	--	
25	80	bk/w	C	--	C	--	T	t+	--	C	--	C	--	--	R	--	R	C	--	t	--	--	--	
26	80	y/w	C	--	C	--	--	t+	--	R	--	C	--	--	--	--	--	--	--	t	--	--	--	
27	65	w	C	S1	C	--	--	t+	--	T+	C	C	--	--	--	--	C	C	T	t	--	--	--	
28	50	br/w	C	--	A	--	--	t+	--	A	--	C	--	--	R	--	C	C	T	t	--	--	--	
29	50	bk/w	C	--	C	--	T	t	T	C	--	C	--	--	T+	--	C	A	--	t	--	--	--	
30	65	bk/w	C	--	C	--	--	t	--	C	--	C	--	--	T+	--	C	C	--	t	--	--	--	
31	20	br/w	C	--	T+	--	--	t	--	C	--	C	--	--	R	--	T+	C	--	--	--	--	--	
32	50	br/w	C	--	T+	--	--	t	--	C	--	C	--	--	T+	--	T+	A	--	--	--	--	--	
32RS	50	bk/w	C	--	C	--	--	c	--	C	--	C	--	--	C	--	C	C	--	t	--	--	--	
33	20	br/w	C	--	T	t	--	c	--	C	--	C	--	--	T+	--	T+	C	--	t	--	--	--	
34	85	gr/w	C	--	T	--	--	t+	--	A	--	C	--	--	--	C	C	--	--	t	--	--	--	
34RS	85	yg/w	C	--	C	--	--	t+	--	C	--	C	--	--	R	--	C	C	R	t	--	--	--	Hematite-T
35	75	gr/w	C	S1?	C	--	--	c	--	A	--	C	--	--	--	C	C	C	T	t	--	--	--	
36	60	gr/w	C	S1?	T	--	c	c	--	A	--	C	--	--	C	C	C	C	T	t	--	--	--	
37	85	gr/w	C	?	T	--	--	--	--	A	--	C	--	--	C	--	C	C	--	t	--	r	--	Hematite-R
38	60	gr/w	C	S1	A	c	--	r	T	A	--	C	--	--	C	--	T	C	T	t	T	--	--	
39	85	gr/br	C	--	C	t	--	--	--	A	--	C	--	--	R	--	C	C	--	t	--	--	--	
40	30	bk/gr	C	--	C	t	--	t	--	A	--	C	--	--	C	--	T	C	--	t	--	--	--	
41	40	bk/w	R	--	C	--	--	t+	C	A	--	C	--	--	--	--	C	C	--	t	--	--	--	
42	85	bk/w	R	--	C	A	--	t+	C	A	--	C	--	--	--	--	C	C	--	t	--	--	--	
43	60	bk/gr	C	--	C	--	--	t	--	C	--	C	--	--	C	--	C	C	--	t	--	--	--	
44	70	br	C	--	C	t+	--	t	--	C	--	C	--	--	C	--	C	C	--	t	--	--	--	
45	85	br	C	--	C	t	--	t	--	C	--	C	--	--	C	--	C	C	--	t	--	--	--	
46	60	br	C	--	C	--	t	t	T+	C	--	C	--	--	C	--	T	C	--	t	--	--	--	Hematite-T
47	60	br	C	S1	C	t+	--	t	--	C	--	C	--	--	C	--	T	C	T	t	--	--	--	
48	5	br/w	C	--	C	--	--	t	C	C	--	C	--	--	C	--	C	T	--	t	--	--	--	
49	5-	br/bk	--	--	--	--	--	t+	--	C	--	C	--	--	C	--	--	--	--	t	--	--	--	Mostly schist (tremolite)
50	40	gr/w	C	S1?	T	t	--	c	C	C	--	C	--	--	--	--	--	--	T	t	--	t	--	
51	40	gr/w	C	--	T	--	r	--	--	C	--	C	--	--	T+	--	C	C	--	t	--	t	--	
52	35	yg/w	C	S1?	C	--	--	t	C	C	--	C	--	--	--	--	C	C	T?	t	--	--	--	
53	75	yg/bk	C	S1?	C	t	c	C	C	--	C	--	--	--	R	C	C	R	t	--	--	--	--	Hematite-C
53RS	20	ygr	C	--	C	--	--	t	T+	C	--	C	--	--	--	--	C	C	--	t	--	--	--	
54	65	yw/gr	C	S1	C	r	r	c	C	C	R	C	--	--	--	--	C	T	T	t	--	--	--	
57	50	y/gr	C	--	C	--	c	t+	C	C	--	C	--	--	--	--	C	C	--	t	--	--	--	Hematite-R
58	20	y/gr	C	--	C	--	--	t+	--	C	--	C	--	--	--	--	C	C	--	t	--	--	--	
97	85	bk/ygr	C	--	C	--	--	t+	--	C	--	C	--	--	--	--	C	C	--	t	--	--	--	
98	65	bk/ygr	C	--	C	--	t+	t+	--	--	--	C	--	--	--	--	--	C	--	t	--	--	--	
101	5	ygr	C	--	--	--	--	r	--	C	--	C	--	--	T	--	--	C	--	t	--	--	--	
102	50	ygr	C	S1	C	--	t+	t+	C	C	--	C	R	--	C	--	C	C	R	t	--	--	--	
103	65	ygr	C	--	C	--	--	c	--	C	--	C	R	--	--	--	--	C	--	t	--	--	--	
104	50	ygr	A	S1	R	--	t	t	--	C	--	C	T	--	T	--	C	C	T	c	--	--	--	
105	40	ygr	C	S1	C	--	t	c	--	C	--	--	--	--	--	--	C	C	R	t	--	--	--	Brown metamict zircon
106	5	ygr	C	--	--	--	--	c	--	C	--	C	?	?	R	--	C	C	--	t	--	--	--	Sericite Schist fragments-A
108	85	y/bk	C	--	R	--	--	t	C	C	--	C	--	--	--	--	C	C	--	t	--	--	--	
109	65	y/bk	C	--	C	T	t	t	C	C	--	C	T	--	C	--	C	C	--	t	--	t	--	Hedenbergite-R
114	40	gr/w	C	--	C	--	t	c	C	C	--	C	--	--	R	--	C	C	--	t	--	--	--	
115	85	bk	R	--	C	--	t	t	R	C	--	C	--	--	C	R	C	C	--	t	--	--	--	
118RS	65	bk/w	C	S1	C	--	--	--	C	C	--	C	--	--	T	--	--	C	R	t	T	--	--	W/inclusions-Rutile?
119	85	bk/yw	C	S1	C	--	--	t	--	T	--	C	--	--	T	--	--	C	R	t	t	--	--	
120	95	bk	R	S1	C	--	--	t	t	R	--	R	--	--	R	--	--	C	T	t	T	--	--	
121	65	bk/ygr	C	vs1	C	r	t	c	--	A	--	C	--	--	T	--	C	C	R	t	--	--	--	
125	35	bk/gry	C	vs1	C	t	t	r	--	A	--	C	--	--	--	--	C	C	T	t	--	--	--	
127	85	bk/lt br	C	S1	C	--	t	t	--	C	--	C	--	--	--	--	C	C	R	t	T	--	--	
128	85	bk/ygr	C	S1	C	--	--	r	R	A	R	C	--	--	--	--	C	--	R	t	--	--	--	
129	85	bk/w	C	S1	C	--	t	--	--	R	--	R	--	--	--	--	C	--	R	t	T	--	--	Metamict zircon (R)
133	85	bk/y	C	S1	C	--	--	t	C	C	--	C	--	--	--	--	C	--	R	t	T	--	--	
134	95	bk/gr	R	vs1	C	--	--	t	R	--	--	R	--	--	--	--	R	C	C	R	t	--	--	
141	20	ygr	C	--	R	--	--	r	R	C	--	C	--	--	--	--	C	T	--	t	--	--	--	

Table 10. Continued

SAMPLE NUMBER	PERCENT MAGNETITE	COLOR	QUARTZ-FELDSPAR	RADIOACTIVITY	ZIRCON	SCHEELITE	POWELLITE	BARITE	HEMITITE-LIMONITE AFTER PYRITE	HORNBLENDE	PYROXENE	BIOTITE	MUSCOVITE	CHLORITE	GARNET	ILMENITE	EPIDOTE-CLINOZOISITE	SPHENE	T MONAZITE	APATITE	ALLANITE	RUTILE	TOURMALINE	REMARKS
143	85	bk/tan	C	vsl	R	--	--	r	T	C	--	R	--	--	T	T	C	T	--	t	--	--	--	
144	65	bk/gr	C	--	R	--	--	r	T	C	--	R	--	--	T	T	C	T	--	t	--	--	--	
145	85	bk/ygr	C	S1	C	t	t	r	R	C	--	C	--	--	T	--	C	C	R	r	--	t	--	
146	35	gr/tan	C	S1	C	--	--	t	T	C	--	C	--	--	T	--	R	C	C	C	--	t	--	--
148	75	bk/gr	C	S1	C	--	--	C+	T	C	--	C	--	--	T	--	C	C	C	T	R	t	--	--
149	65	bk/gr	C	S1	C	--	t	t	--	C	--	C	--	--	C	--	C	C	C	R	t	T	--	--
151	85	bk/gr	C	S1	C	--	--	r	R	C	--	C	--	--	--	R	C	C	C	R	r	--	t	--
152	85	bk/ygr	C	S1	R	--	--	t	R	R	--	C	--	--	--	--	--	--	T	--	t	--	t	-- Metamict zircon (R)
154	50	bk/gr	C	--	C	--	t	t	R	C	--	C	--	--	R	--	C	--	--	t	--	--	--	
156	65	bk/gr	C	vsl	C	t	--	r	R	C	--	C	--	--	T	--	C	T	t	r	--	--	--	
157	95	bk/y	C	S1	C	--	--	r	--	C	--	C	--	--	T	--	C	C	R	r	--	--	--	
160	35	gr	C	--	C	--	t	t	R	C	--	C	--	--	R	--	R	C	--	t	--	--	--	
161	30	gr	C	--	C	--	--	t	R	C	--	C	--	--	C	--	T	T	--	t	--	--	--	
201	70	y/gry	C	--	A	T	--	R	C	A	R	A	--	R	R	--	A	R	--	--	--	--	--	
202	40	y/gry	A	--	C	R	--	R	C	A	R	C	--	R	T	--	A	R	R	t	--	--	--	
203	50	y/gry	A	--	A	R	--	R	A	A	R	C	--	R	T	--	C	R	--	t	--	--	t	
204	10	y/gry	A	--	--	--	--	C	C	A	--	A	--	--	T	--	A	C	--	t	--	--	t	
205	40	y/gry	A	--	A	R	--	--	--	A	A	A	--	R	R	--	A	C	--	t	--	--	t	
208	30	y/gry	A	S1	C	T	--	R	R	A	R	C	--	R	R	R	A	R	--	t	--	--	--	
217	40	buf/gry	A	S+	C	T	T	T	R	A	R	A	--	C	R	--	A	C	--	--	--	--	--	
224	90	gr/gry	A	S	C	--	--	R	T	A	--	C	--	--	--	C	A	A	t	t	--	--	t	
234	10	gr/gry	A	--	R	--	--	T	--	A	--	A	--	R	--	--	C	C	--	t	--	--	--	
240	50	tan/gry	A	S+	C	--	T	C+	--	A	--	C	--	--	R	R	A	C	--	t	--	--	--	Metamict zircon (R)
242	75	gr/gry	A	--	A	--	--	--	--	A	A	--	--	--	--	C	A	A	t	t	--	--	--	
247	20	buf/gry	A	--	C	--	T	R	--	A	--	C	T	--	--	C	A	A	--	t	--	--	--	
248	40	gr/gry	A	--	A	T	--	R	R	A	--	C	T	--	--	R	A	A	--	t	--	--	--	
260	20	dark gry	A	--	C	--	--	C	--	A	R	A	--	--	--	--	A	A	--	t	--	t	--	
265	45	buf/gry	A	--	C	--	--	R	R	A	--	C	--	--	R	R	A	C	--	t	--	--	--	
267	75	buf/gry	A	--	T	--	--	C	R	--	--	C	--	--	C	A	--	A	--	t	--	--	--	
272	30	gr/tan	A	--	R	--	--	C+	--	--	--	A	T	--	--	A	R	A	--	t	--	--	--	
274	80	tan/gry	A	S	R	--	--	C+	R	--	--	C	--	--	R	A	R	A	t	t	--	--	--	
276	--	tan	A	S	A	--	--	R	C	A	--	A	--	R	r	--	A	A	--	t	--	--	--	
308	75	gr/y	A	M	C	--	T	R+	--	C	--	C	--	--	C	A	A	A	--	t	--	--	--	
309	80	y/gry	A	M	A	--	--	--	R	A	R	R	--	R	--	R	A	A	t	t	--	--	--	
330	40	gr/y	A	--	C	--	--	T	--	R	--	C	--	t	C	R+	A	C	--	--	--	--	--	
331	60	y	A	M	A	--	--	--	R	R	--	R	--	--	R	R	A	C	--	t	--	--	--	Metamict zircon (R)
403	75	buf/gry	A	--	C	T	--	C	R	--	--	C	--	--	R	C	C	A	--	t	--	--	--	Actinolite (R)
405	10	tan/gry	A	--	C	R	--	R	R	--	--	C	--	--	T	R	R	C	R	--	t	--	t	
411	80	tan/gry	A	--	C	--	--	C+	R	--	--	C	--	--	R	A	C	A	--	t	R	--	--	
413	60	tan/gry	A	--	R	--	--	C+	R	--	--	C	--	--	A	C	A	--	t	R	--	--	--	Metamict zircon (R)
414	80	tan	A	--	C	T	--	C	R	R	R	C	--	--	R	A	R+	A	--	t	--	--	--	
416	75	lt.tn/gry	A	S	C	--	--	C	R	T	--	A	--	--	--	C	C	R+	--	t	--	--	--	Metamict zircon (R+)
425	90	md.gry	A	--	R	--	--	C	--	R	--	R	--	--	R	A	C	A	--	t	--	--	--	
427	60	gry	A	S	C	--	--	R	C	A	R	+	--	R	C	A	A	A	--	t	R	--	--	
430	90	tan/gry	A	S	R	--	--	C	--	--	--	C	--	--	R	C	C	A	--	t	R	--	--	
433	90	tan/gry	A	--	R	--	--	C	R	--	--	C	--	--	R+	C	--	A	--	t	R	--	--	
437	90	tan-	A	--	C	--	R	C	--	R	--	C	T	--	R	C	R	A	--	t	R	--	--	
442	70	tan	A	--	R	--	T	C	--	R	R	C	--	R	A	C	R	A	--	t	R	--	--	
445	50	tan/gry	C	--	C	--	T	T	R	A	C	--	--	--	C	C	C	A	--	t	R	--	--	Actinolite (R)
448	80	buf/gry	A	S	C	T	T	R+	T	C	--	R	--	--	R	C	A	A	--	t	R	--	t	
454	75	y/gry	C	--	A	--	T	R	R	A	T	R	--	C	--	--	A	C	--	t	--	--	--	
461	trace	y/gry	A	--	R	--	--	--	R	C	--	A	--	A	R	--	A	R	--	--	t	R	--	--
463	60	y	A	--	A	T	--	T	R	C	--	C	--	C	R	--	A	C	--	t	--	--	--	

Petrographic Description: Thin section examination shows the sample to be composed predominantly of *barite* (90%). The crystals commonly exhibit tabular crystal habit (with general preferred orientation) and usually contain one or more small inclusions of quartz. Although scattered throughout, small pyrite cubes are concentrated in distinct laminae (5mm) marked by abundant microcrystalline to cryptocrystalline quartz (5%). Several thin quartz veinlets cross-cut barite crystals. Abundant fine-grained aggregated magnetite grains observed (5%).

Sample #17

Location: SW-1/4 NE-1/4 NW-1/4, Section 28, T23S, R36E.

Hand Sample Description: The sample is dark-gray, fine-grained metamorphic rock (pelite) exhibiting a well-developed schistosity parallel to laminar bedding planes. Abundant along some laminae are 1-3mm long porphyroblasts with blade-like crystal form. Most porphyroblasts are oriented parallel to subparallel to schistosity/bedding, but some orientations range up to perpendicular angles.

Petrographic Description: Thin section examination reveals that the sample contains scattered bladed crystals of kyanite (1-3mm in length) set in a matrix of fine-grained (0.05mm) and microcrystalline (0.01mm) quartz with minor fine-grained mica. Abundant opaques (magnetite?) noted. Also found within the ground mass is dravite tourmaline (?).

Sample LK

Location: SW-1/4 NE-1/4 NW-1/4 Section 28, T23S, R36E.

Hand Sample Description: Bluish-gray, fine-grained metamorphic rock containing numerous light-colored tabular porphyroblasts measuring up to 3mm in length.

Petrographic Description: Thin section examination shows the rocks to be made up of scattered tabular porphyroblasts measuring up to 3mm in length and composed of aggregated, fine-grained muscovite (sericite) set in a ground mass of microcrystalline quartz (60%), muscovite (70%), and abundant opaques (magnetite?; 20%). Minor accessory minerals include magnesium-rich biotite and dravite tourmaline. The fine-grained muscovite is a deuteric alteration product and pseudomorphic after andalusite. Some of these porphyroblasts are cut by quartz veinlets.

Summary

The distribution of stream sediment (-80 mesh) samples having anomalous values of selected elements is presented on Plate 2. Anomalous gold values (from heavy mineral concentrate samples) are also included. In addition, anomalies detected by chemical analyses of both stream sediment and heavy mineral concentrate samples are shown on Plates 5B and 5C (in pocket), respectively, in the form of drainage basin maps combined with geology. Similar anomaly maps are presented specifically for barium and tungsten, two elements of particular economic interest in the WSA, by combining results of chemical analyses of both stream sediment and heavy mineral concentrate samples with findings of the heavy mineral examination (Plates 5D and 5E; in pocket). Heavy mineral concentrate samples with measurable radioactivity are shown on Plate 5F (in pocket).

Major findings of the geochemical survey, heavy minerals examination, and petrographic studies are as follows:

- Barite appeared in most heavy mineral concentrate samples examined, including those collected from granitic terrains. Plate 5D (in pocket), shows samples in which common to abundant amounts were observed or detected in anomalous amounts by chemical analyses. Most of the anomalous areas in the northern two-thirds of the WSA are associated with roof pendant rock of the Kernville Series, which is known to contain sedimentary barite (see Petrographic Examination). However, samples from the southern one-third of the WSA were collected from streams draining granitic terrain. The presence of anomalous barite here is problematical, but it could represent vein-type introduction into the system.

- The tungsten minerals scheelite and powellite appeared in many of the samples examined under fluorescent light, but normally in trace amounts. Plate 5E (in pocket) shows those localities where scheelite and/or powellite was present in rare or common abundances were observed or where tungsten was detected in anomalous amounts by chemical analyses. Most of these localities are associated with drainage basins that are underlain entirely or, in part, by metamorphic rock of the Kernville Series in areas of known skarn deposits.

- Heavy mineral concentrate samples with measurable radioactivity Plate 5F (in pocket), normally contain common to abundant grains of zircon, many of which were metamict. In combination with zircon found in radioactive samples collected from the southern margin of the area were rare allanite grains.

- Observed sulfide minerals in heavy mineral concentrate samples were limited to pyrite, which when present occurred in trace to rare amounts and usually altered to limonite.

The geochemical survey revealed anomalous concentrations of metallic elements in several areas that were previously unknown to contain mineralization.

- An area immediately northwest of Big Pine Meadow contains nine sample sites, over an areal distribution of one mile, that show anomalous concentrations of Cu, Mo, Au, Ag, Sb, and U (Plates 3, 5B, and 5C). All samples represent small, independent, subparallel drainages that head immediately west of the WSA boundary. Six samples show copper-molybdenum anomalies, yet no samples are anomalous in tungsten, although small garnetiferous tactite bodies containing visible sulfides were noted within the area during the geologic mapping. These base metal anomalies are associated with a barium anomaly, (Plates 3 and 5D) which, coupled with the absence of tungsten values, may indicate the presence of an over printing hydrothermal system of mineralization.

- An anomalous concentration of W, (Sample No. 29, Plate 3) coincident with a discrete magnetic high (Area No. 6, Plate 2) in Section 2, T24S, R36E, may indicate an unexposed tungsten-bearing tactite zone.
- Geochemical anomalies recorded for As, Ag, Au, and Sb along the northwestern boundary of the WSA may indicate the presence of a mineralized hydrothermal system.

- At the southern end of the Rockhouse Basin WSA, a geochemical suite of base metals associated with anomalous gold-silver values may indicate an area of hydrothermal mineralization. However, the geochemical anomalies are of relatively low magnitude, and there is a lack of corroborating evidence due, in part, to inaccessibility of the area. Additional analytical data and field work are needed for a full evaluation of this rugged area.

MINERAL RESOURCE ASSESSMENT AND LAND CLASSIFICATION

by

Gary C. Taylor, Ralph C. Loyd, John T. Alfors,
Melvin C. Stinson, Rodger C. Chapman,
Michael A. Silva, and Thomas P. Anderson

The following section on the mineral resource potential of the Rockhouse Basin Wilderness Study Area is a synthesis of multiple-source data developed during the course of the study. The data were examined and analyzed by a panel of Division of Mines and Geology (DMG) geologists with extensive mineral expertise, and the resource potential assessment expressed in the land classification of various mineral occurrence groups (below and on Plates 6A, 6B, 6C, and 6D) represents the consensus of this panel.

The mineral potential classification format (Table 11) was developed originally by the U.S. Bureau of Land Management (BLM) during the course of the California Desert Conservation Area (CDCA) GEM studies. This format was specified in the BLM-DMG contract and thus mandated for utilization in the present study. In the evaluation and classification of the Rockhouse Basin Wilderness Study Area, both direct and indirect evidence of potential mineralization were considered. Direct evidence included reported mineral occurrences, historical and/or present mine production, mineral exploration data, geological field mapping, and geochemical survey anomalies. Indirect evidence included gamma-ray potassium anomalies, tonal anomalies, lineaments, and Bouguer gravity anomalies. However, combination, correlation, and coincidence may change the importance given to certain data, and the relative weighting of evidence in particular contexts is based upon the professional expertise and judgment of the panel staff.

The bases for the mineral resource potential ratings for the classified areas shown on Plates 6A, 6B, 6C, and 6D are summarized below.

Metallic Resources

TUNGSTEN AND MOLYBDENUM - Plate 6A (in pocket)

Areas 1, 2, and 3	Classified *4D*. Past production of tungsten, with minor associated molybdenum, from the Kern Sierra, Do Good/Humbug and Western #1 mines. All above-listed properties are under active claims.
Area 4	Classified *3C*. Geochemical anomalies for tungsten in excess of the 95 percentile were recorded in several stream heavy sediment samples, additional geochemical anomalies (-80 mesh material) were recorded for copper, molybdenum, gold, uranium, and antimony which are typical metallic elements associated with skarn mineral assemblages, field mapping revealed the development of small, garnetiferous tactite zones along metasedimentary-igneous contacts.
Areas 5 and 6	Classified *3C*. Occurrence of Kern Sierra, Do Good/Humbug properties within these zones, occurrence of carbonate-bearing metasediments within close proximity to intrusive felsic rock contact zones, field documentation of small tactite bodies occurring within and along metasedimentary septa and xenoliths.

Table 11. U.S. Bureau of Land Management mineral-land classification scheme.

I. LEVEL OF FAVORABILITY

1. The geologic environment and the inferred geologic processes do not indicate favorability for accumulation of mineral resources.
2. The geologic environment and the inferred geologic processes indicate low favorability for accumulation of mineral resources.
3. The geologic environment, the inferred geologic processes, and the reported mineral occurrences or valid geochemical/geophysical anomaly indicate moderate favorability for accumulation of mineral resources.
4. The geologic environment, the inferred geologic processes, the reported mineral occurrences, and/or valid geochemical/geophysical anomaly, and the known mines or deposits indicate high favorability for accumulation of mineral resources.

II. LEVEL OF CERTAINTY

A. The available data are insufficient and/or cannot be considered as direct or indirect evidence to support or refute the possible existence of mineral resources within the respective area.

B. The available data provide *indirect evidence* to support or refute the possible existence of mineral resources.

C. The available data provide *direct evidence*, but are quantitatively minimal to support or refute the possible existence of mineral resources.

D. The available data provide *abundant direct and indirect evidence* to support or refute the possible existence of mineral resources.

Area 7 — Classified *3C*. Geochemical anomalies for tungsten and field-mapped occurrence of small tactite body.

Area 8 — Classified *3C*. Occurrence of Western #1 property within the area, geochemical anomalies for W and Mo in several drainages, and the occurrence of metasedimentary-igneous contact zone.

Area 9 — Classified *2C*. Geochemical anomaly for W, area is coincident with a well-defined magnetic high and close association with metasedimentary-igneous contact zone.

Rest of Area — Classified *1C*. Utilizing geologic and geochemical negative data. No anomalous concentrations of W, Mo within stream sediment samples. Lack of favorable host rocks within the area as verified by field mapping and no favorable felsic igneous-metasedimentary structure.

ANTIMONY, ARSENIC, COPPER, GOLD, LEAD, SILVER, AND ZINC - Plate 6B (in pocket)

Area 1 — Classified *3C* - Based on geochemical anomalies for Cu, Mo, Sb, Au, Ag - no field evidence to support higher favorability (i.e. minor tactite occurrences and no evidence of hydrothermal alteration zone). Area is coincident with a magnetic low, possibly the result of the adjacent high over the Summit Gabbro, or which could be indicative of altered rock zones.

Area 2 — Classified *2C* - Favorable association of elements Au, Ag, As, and Sb - although low geochemical anomalies recorded - quartzite could serve as a host rock but lack of other supporting geologic evidence downgraded assessment.

Area 3 — Classified *2C* - Geochemical anomalies for Ag, As, Pb, Sb, U and Th although data based on only 2 geochemical samples. Area underlain by granitic rock with no major favorable structures, faults, or tonals apparent, although numerous widely separated pegmatite dike systems containing minor sulfide mineralization are present.

Area 4 — Classified *2C* - Several geochemical anomalies, Pb, Zn, Ag, Sb, covering small drainage areas. Both heavy concentrates and stream sediments show anomalous amounts of base metals.

Area 5 — Classified *2C* - Geochemical anomalies for Zn, Pb, Sb, within heavy mineral fraction.

Area 6 — Classified *2C* - Favorable geologic environment coincident with metasedimentary-igneous contact zone coupled with geochemical anomalies for Cu, Pb, Sb, Zn, Ag, and Au.

Rest of Area — Classified *1C* - Based on lack of geochemical anomalies and absence of favorable geologic units or structure.

Non-Metallic Resources

BARITE, FELDSPAR, GEM STONES, AND LIMESTONE - Plate 6C (in pocket)

Area 1 — Classified *4D*. Bedded calcareous horizon containing a series of mines/properties with recorded barite production. Properties are under active claim.

Area 2 — Classified *3C*. Massive quartzite and schist with small discontinuous calcareous lenses containing intercalated barite and limestone. Moderate favorability but direct evidence. Detailed field geology of the the area delineated small barite pods or lenses. Downgraded potential also because of small size of mineralized area although zones may widen at depth. Minor geochemical support for Ba.

Area 3 — Classified *2C*. Area underlain by roof pendant that does contain limestone or marble lenses - no visible barite. Heavy mineral concentrates did not show barite. However, geochemical survey shows some barite anomalies in area with trace amounts of barite seen in heavy concentrates during optical examination.

Area 4 — Classified *2C*. Barite commonly found in heavy concentrates; however, field examination detected only minor calcareous sediments within area.

Area 5 — Classified *4D*. Blue gem prospect examined in field - turquoise mineralization visible in pit face. Prospect is under active claim.

Area 6 — Classified *2C*. Geologic environment favorable for possible formation of additional turquoise resources with contact between metasediments and pegmatite dikes. Feldspar resource potential downgraded because of small size of dikes.

Areas 7 and 8 — Classified *2D*. Occurrence of calc-silicate/marble horizons with supporting geochemical anomalies for barite. Low favorability due to apparent high barite content of igneous rocks which contribute to the geochemical anomaly.

Area 9 — Classified *1D*. Area was field-checked extensively and lies within a nonreceptive massive quartzite horizon devoid of calcareous beds. No supporting geochemical values for barite.

Rest of Area — Classified *1D*. Includes granitic areas and small detached septa of roof pendant rocks composed principally of quartzite.

URANIUM - THORIUM - Plate 6D (in pocket)

Area 1 — Classified *3C* - NURE Airborne Radiometric Survey indicates a low value positive anomaly, anomalously high geochemical values for uranium and thorium occur in the area, existence of extensive pegmatite zones, and documentation of uranium minerals in the adjacent John Thomas Claims.

Area 2 — Classified *3C* - NURE surveys reveal a low value positive anomaly, anomalously high geochemical values, occurence of allanite-bearing pegmatitis, and numerous radioactive point sources and metamict zircons noted during the optical examination of the heavy mineral splits.

Area 3 — Classified *2C* - Although contiguous with Area 2 and sharing both radiometric and geologic similarities, favorability was downgraded due to scarcity of radioactive minerals within the heavy sediment samples.

Rest of Area — Classified *1D* - No radiometric anomalies and no geochemical anomalies.

REFERENCES

Boles, W.F., 1956, John thomas Claims: U.S. Atomic Energy Commission Preliminary Reconnoissance Report 1412, 2 p.

Bergquist, J.R., and Nitkiewiez, A.M., 1982, Geologic map of the Dameland Wilderness and contiguous roodless areos, Kern and Tulare counties, Colifornio: U.S. Geologicol Survey Miscellaneous Field Studies Map MF-1395A, scale 1:48,000.

Burnett, J.L., 1963, Reconnoissance geologic map of port of the Hackett Peok quadrangle, Colifornio Divisian of Mines ond Geology, Fresna 1° x 2° Sheet of the State Geologic Map.

Burnett, J. L., 1976, Kaweah Peaks Pluton and its relationship to the oge of the Kern Canyon fault, Tulore County: Colifornia Divisian of Mines ond Geology Map Sheet 35, scale 1:62,500.

Busey, A.P., 1936, Untitled consulting report (confidential reference).

Coleman, M.N., 1934, Untitled consulting report (confidential reference).

Diment, T.C., Urbon, T.C., Soss, J.H., Marshall, V.V., Manrae, R.J., and Lachenbruch, A.H., 1975, Temperatures ond heot contents based on conductive tronsport of heat, *in* Assessment of geothermol resources af the United Stotes, U.S. Geologicol Survey Circulor 726.

Dodge, F.C.W., 1972, Trace-element contents of same plutanic racks of the Sierra Nevada Bathalith: U.S. Geologicol Survey Bulletin 1314-F.

Evernden, J.F., and Kistler, R.W., 1970, Chronology of emplacement of Mesozaic bathalithic complexes in Colifornio ond western Nevado: U.S. Geological Survey Professianal Paper 623, 42 p.

Galanis, P., 1983, Persanal Communication: U.S. Geologicol Survey, Menla Park, CA.

Hanna, W.F., Oliver, H.W., Sikoro, R.F., ond Robbins, S.L., 1975, Bokersfield Sheet: Bouger Grovity Map of Colifornio, Colifornio Divisian Mines ond Geology, scole 1:250,000.

Henderson, J.R., Jr., Stromquist, A.A., ond Jespersan, Anna, 1966, Aeramagnetic map of ports af the Mother Lode gold and Sierro foothills capper mining district, Colifornia, and its geologic interpretation: U.S. Geologicol Survey Geophysicol Investigatians Map GP-561, scole 1:62,500, map ond 4 p. text.

Hewitt, D.F., and others, 1936, Mineral resources in the region araund Boulder Dam, U.S. Geological Survey Bulletin 871, p. 150.

Higgins, C.T. 1980, Geathermal resources af Colifornia: Colifornia Divisian Mines ond Geology, Geologic Data Map Series, Map Na. 4, scole 1:750,000.

Halen, J.B., 1978, Geology and alteratian of the Casa Geathermal Area, Inya County, Colifornio, University af Utah Research Institute, Earth Science Laboratory Report, DOE Contract EG-78-C-07-1701.

Huber, N.K., Oliver, H.W., Boiley, R.A., Thurber, H.K., Miller, M.S., Hillman, C.T., Lindsey, D.S., and Marris, R.W., 1982, Mineral resources af the Minerets Wilderness ond odjocent oreos, Modero and Mono counties, Colifornio: U.S. Geological Survey Bulletin 1516 A-D, 159 p.

Jochens, R.C., 1983, Geophysical maps ond interpretatian af the Dameland Wilderness ond contiguous raodless oreos, Kern and Tulore counties, Colifornia: U.S. Geologicol Survey Map MR-1395-B.

Jennings, C.W., 1975, Foult map af Colifornio: Colifornio Division of Mines and Geology, scole 1:750,000.

Krauskapf, K.B., 1953, Tungsten deposits af Modero, Fresno, ond Tulore counties, Colifornio Divisian af Mines ond Geology Special Repart 35, p. 10-11.

Kundert, C.J., 1953, Preliminory field report—Nine Mile Canyon barite deposit (confidentiol reference).

Kundert, C.J., 1957, Borite: Colifarnia Division of Mines Bulletin 157, p. 72-73.

Lonphere, M.A., Dolrymple, G.B., and Smith, R.L., 1975, K-Ar oges of Pleistocene rhyolitic volconism in the Casa Range, California Geology, v. 3, no. 6, p. 339-341.

Levinsan, A.A., 1980, Intraductian ta explaratian geochemistry, second edition: Applied Publishing Ltd., Wilmette, Illinais, 924 p.

McNeil, C.T., 1934, Pasa Boryto Deposit—Consulting and anolytical repart (confidential reference).

Miller, W.J., 1931, Geologic sectians across the sauthern Sierro Nevada af Califarnio: Califarnia University Department Geological Science Bulletin, v. 20, na. 9, p. 331-360.

Miller, W.J., and Webb, R.W., 1940, Descriptive geology of the Kernville quodrongle, Colifarnia: Colifornia Jaurnal Mines ond Geology, v. 36, na. 4, p. 343-378, Plate 2, scale 1:125,000.

Moore, J.C., and Dodge, F.C.W., 1980, Lote Cenozaic volconic racks at the southern Sierra Nevodo, Colifarnia; I, Geology ond petrology: Geological Society of Americo Bulletin, v. 91, na. 9, p. 1515-1518.

Oliver, H.W., 1982, Geophysicol studies of the Minorets Wilderness and odjocent areas, Modero ond Mano counties, Colifarnio, *in* U.S. Geological Survey Bulletin 1516 A-D.

Ross, D.C., 1980, Reconnaissance geologic map of bosement racks at the southernmost Sierro Nevada (north to 35° 30'N): U.S. Geologicol Survey Open-File Report 80-307, 23 p., scale 1:125,000.

Ross, D.C., 1983, Generalized geologic map af the southern Sierra Nevodo Colifarnia showing sample locations far K-Ar ond Rb-Sr dates: U.S. Geological Survey Open-File Report 83-231.

SAS Institute, Inc., 1982, SAS USER'S GUIDE, BASICS (1982 Editian): SAS Institute, Inc., Box 8000, Cary, N.C. 27511, 921 p.

Scott, E.W., 1983, Petraleum potential af Wilderness Lands, Colifornio: U.S. Geological Survey Miscellaneaus Investigations Series Map I-1588, scale 1:1,000,000.

Smith, A.R., 1965, Bokersfield sheet: Colifarnia Division af Mines ond Gealagy Geologic Atlas of Califarnio Mop, 1:250,000.

Smith, M.B., Engler, V.L., Lee, D.I., Horn, K.J., and Wayland, R.G., 1974, Reparted accurrences of selected minerals in the southern third af Colifornio: U.S. Geological Survey Map MR 49.

Troxel, B.W., Stinsan, M.C., and Chesterman, C.W., 1957, Uranium in Califarnia: Califarnia Divisian of Mines and Geology Bulletin 176, p. 669-687.

Tucker, W.B., and Sampson, R.J., 1938, Mineral resaurces of Inyo County, *in* Thirty-fourth repart of the State Minerologist, Califarnio Division of Mines, p. 19, 481-3.

Tucker, W.B., and Sampsan, R.J., 1931, Feldspor, silico, andalusite and kyanite deposits af Califarnia, *in* Twenty-seventh Report of the State Minerologist, Califarnio Divisian af Mines, p. 414-6.

Tucker, W.B., and Sampson, R.J., 1943, Current mining activities in southern Colifornio, *in* Thirty-ninth Report af the State Mineralagist, Colifornio Divisian af Mines, p. 121.

Tucker, W.B., Sompsan, R.J., and Oakeshatt, G.B., 1949, Minerol resources of Kern County: Califarnia Jaurnal af Mines and Geology, v. 45, p. 272.

Unian Corbide Carparatian, Nucleor Divisian, 1981, Hydrageachemical and streom sediment reconnaissance basic data far Bakersfield quadrangle, Colifarnio: U.S. Department of Energy GJBX-419(81), 155 p.

U.S. Deportment of Energy, 1980, Airborne gamma-ray spectrameter and magnetometer survey, Bakersfield quodrongle, Colifarnia: High Life Helicapters, Inc./QEB, Inc., U.S. Deportment af Energy GJBX-231(80).

U.S. Geological Survey, 1979, Aeromagnetic map af the Damelands area, Colifarnio: Open-File Repart Na. 79-1234.

U.S. Geological Survey, 1982, Aeramagnetic map of Sierra Owens oreo, Colifarnia: Open-File Report Na. 82-1083.

Webb, R.W., 1937, Geology of o portion of the southern Sierro Nevodo of Colifarnia: The narthern Kernville quodrongle, unpublished Ph.D. thesis.

Weber, F.H., Jr., 1963, Borite in Colifarnio: Colifornio Divisian af Mines ond Geology Minerol Information Service, v. 16, na. 10.

Weber, F.H., Jr., 1966, Borite: Colifarnia Divisian af Mines ond Geology Bulletin 191, p. 94-98.

Wells, J.H., 1973, Placer examination: principles ond practice: U.S. Bureau of Land Monogement Technicol Bulletin 4, 209 p.

Winstan, W.B., 1949, Barium: Colifornio Journal of Mines and Geology, v. 45, p. 90.

84 78811

COLLATE

3 microfiche

TN
24
C3
A33
No 157

TN
24
C3
A33
No.157

TN
24
C3
A33
No 157

THIS BOOK IS DUE ON THE LAST DATE
STAMPED BELOW

BOOKS REQUESTED BY ANOTHER BORROWER
ARE SUBJECT TO RECALL AFTER ONE WEEK.
RENEWED BOOKS ARE SUBJECT TO
IMMEDIATE RECALL

MAR 16 1992

LIBRARY, UNIVERSITY OF CALIFORNIA, DAVIS

D4613 (12/76)

MINERAL RESOURCE POTENTIAL OF THE ROCKHOUSE BASIN WILDERNESS STUDY AREA
KERN AND TULARE COUNTIES, CALIFORNIA

Special Report 157

MINERAL RESOURCE POTENTIAL OF THE ROCKHOUSE BASIN WILDERNESS STUDY AREA KERN AND TULARE COUNTIES, CALIFORNIA

1986

CALIFORNIA DEPARTMENT OF CONSERVATION
DIVISION OF MINES AND GEOLOGY

THIS SUMMARY REPORT WAS PREPARED FOR
THE U.S. BUREAU OF LAND MANAGEMENT
UNDER CONTRACT NO. 4A-551-CT3-440039 BY
THE CALIFORNIA DEPARTMENT OF CONSERVATION,
DIVISION OF MINES AND GEOLOGY

COLLATE:
14 PIECES

See collate note on previous page also

SPECIAL REPORT 157

UNIVERSITY OF CALIFORNIA
DAVIS
MAY 21 1987
CALIF. DEPOS.
GOV'T. DOCS.-LIBRARY

THE RESOURCES AGENCY
GORDON K. VAN VLECK
SECRETARY FOR RESOURCES

STATE OF CALIFORNIA
GEORGE DEUKMEJIAN
GOVERNOR

DEPARTMENT OF CONSERVATION
RANDALL M. WARD
DIRECTOR

TN
27
C3
A3
no. 157

GEOLOGIC MAP SHOWING MINES AND PROSPECTS OF THE ROCKHOUSE BASIN WILDERNESS STUDY AREA KERN AND TULARE COUNTIES, CALIFORNIA

Base map by U.S. Geological Survey 15 minute series, Lamont Peak and a portion of the Onyx quadrangles.

Geology and Mining Claim Compilation By G.C. Taylor, R.C. Loyd, J.L. Burnett and S.L. Kohler September and October, 1983.

SCALE 1:62 500

1 1/2 0 1 2 3 4 MILES

3000 0 3000 6000 9000 12000 15000 18000 21000 FEET

1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 80 FEET

DESCRIPTION OF MAP UNITS

CENOZOIC — QUATERNARY

Qal — ALLUVIUM - Unconsolidated, poorly sorted gravel, sand and silt in stream channels. Thinly laminated, organic rich alluvial sediments tens of feet thick occur within Big Pine, Lamont, Chimney, and other smaller intermontane meadows.

AGE UNKNOWN — **Qls** — LANDSLIDE DEPOSITS - Broken and disoriented rock masses.

CENOZOIC — TERTIARY — Miocene, Pliocene

Tb — BASALT - Dark-grey to black on fresh surface, light-grey on weathered, olivine-augite basalt flow, maximum thickness less than 100 feet with minor development of columnar jointing, typically microcrystalline groundmass with minor phenocrysts (1-40mm) grey glassy quartz.

MESOZOIC — CRETACEOUS

Ki — ISABELLA GRANODIORITE OF MILLER (1931) - Medium-to coarse grained, inequigranular, leucocratic granite to granodiorite. Texture may vary locally from equigranular to coarsely porphyritic with prominent phenocrysts of potassium feldspar and alternating bands of quartz. Peripherally intruded by late stage pegmatite and aplite dikes in the Long Valley and Lamont Meadow areas.

MESOZOIC — JURASSIC

Js — SACATAR QUARTZ DIORITE OF MILLER AND WEBB (1940) - Medium-to fine-grained equigranular mesocratic hornblende quartz diorite to an equigranular leucocratic hornblende granodiorite. Contact zone between Sacatar and Isabella typically transitional with substantial areas of mixed rocks.

MESOZOIC — JURASSIC? TRIASSIC?

JTR_{sg} — SUMMIT GABBRO OF MILLER AND WEBB (1940) - Coarse- to medium-grained, inequigranular to porphyritic hornblende gabbro. Contacts with Sacatar Mighty contaminated with inclusions and schlieren and form extensive mixed rock zones.

PALEOZOIC

MzPzk, MzPzkm, MzPzkq, MzPzkg — MzPzk KERNVILLE SERIES OF MILLER (1931) - Well-foliated, locally slightly folded, laterally continuous metasedimentary rocks consisting of quartz mica schists, quartzites and phyllites with minor assemblages of marble, skarn, hornfels and metavolcanic rock.

MzPzkg Laterally continuous well bedded metasedimentary sequence containing barite. Barite is coarsely crystalline to thinly laminated, white-to dark grey, with variable widths to 60 feet.

MzPzkm Laterally continuous beds or detached outcrops of metamorphosed limestone (marble) - marbles are coarsely crystalline to microcrystalline, white- to bluish-grey, with varying degrees of siliceous replacement.

MzPzkq Quartzite - Grey to dark, massive to thinly laminated, coarse crystalline to cryptocrystalline with iron-stained weathered surface.

SYMBOLS

15 — MINE OR PROSPECT - number refers to table of mines and prospects.

CONTACT - Hachured where gradational.

FAULT

LANDSLIDE - Arrows indicate direction of movement.

60 — STRIKE AND DIP OF INCLINED BEDDING.

STRIKE AND DIP OF FOLIATION.

90 — Inclined.

Vertical.

STRIKE AND DIP OF JOINTS.

30 — Inclined - Measured in field.

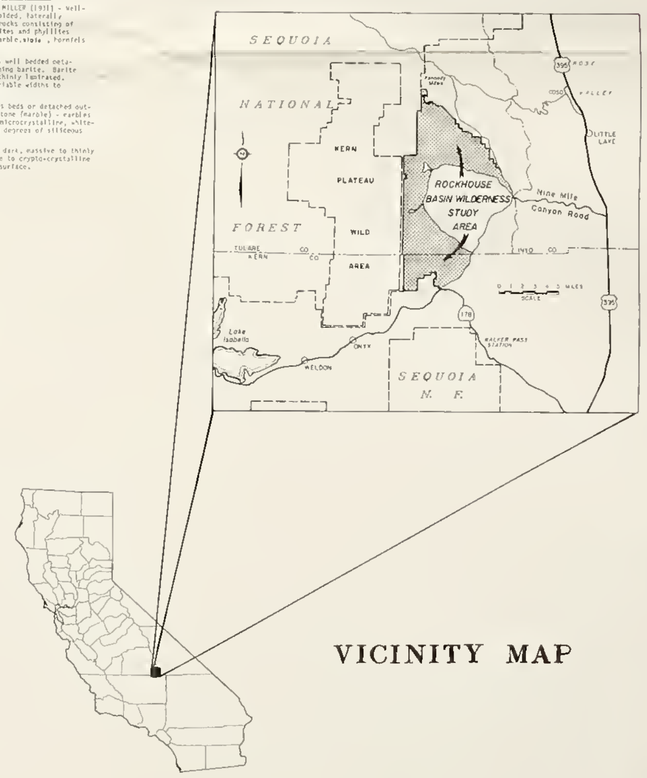
Steeply dipping to vertical - Mapped from aerial photographs

Vertical - Measured in field.

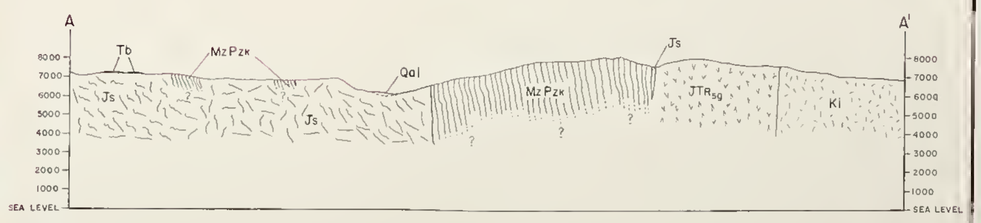
BOUNDARY - Rockhouse Basin Wilderness Study Area.

16° TRUE NORTH MAGNETIC NORTH

APPROXIMATE MEAN DECLINATION, 1943



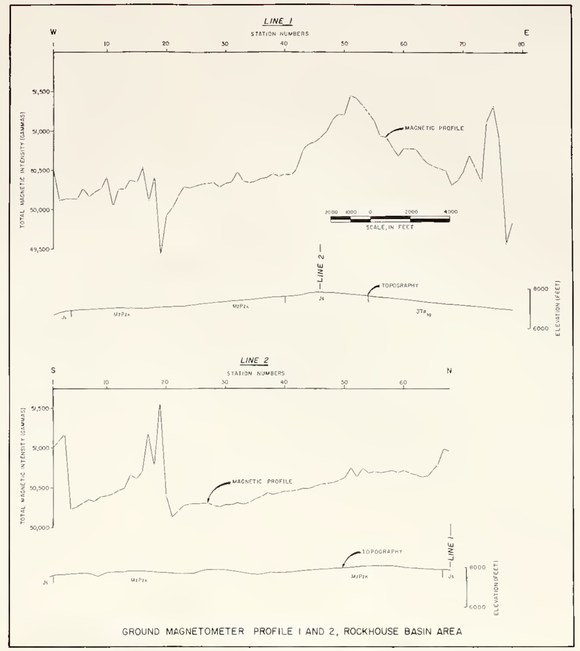
VICINITY MAP



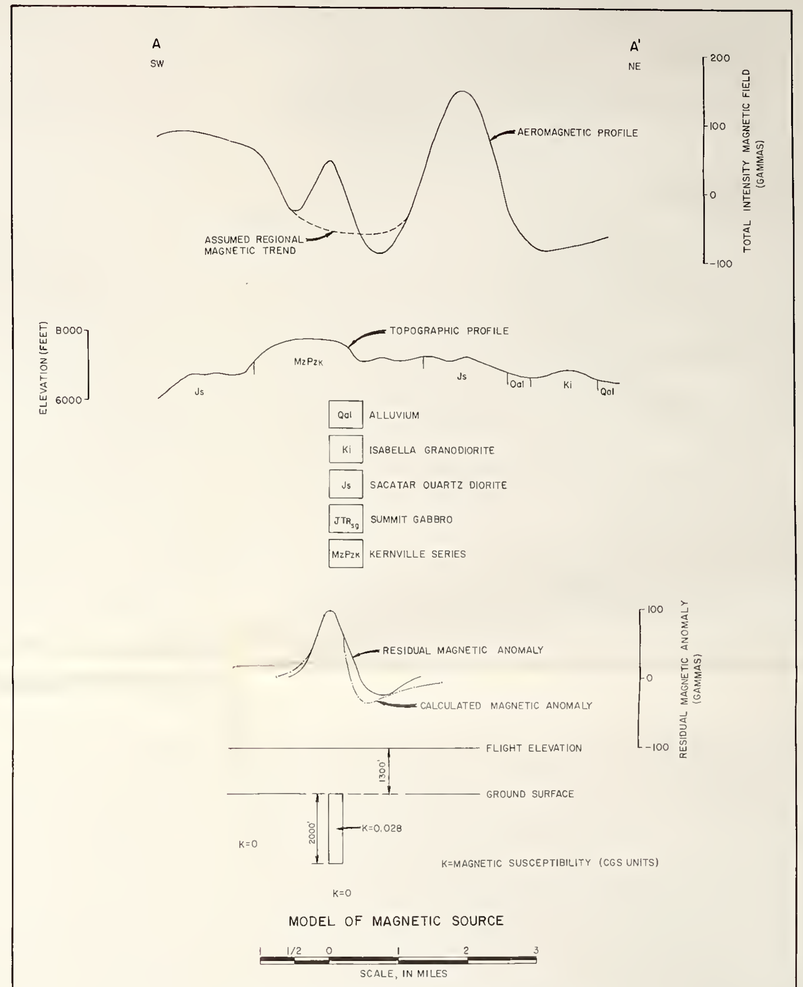
Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039.

TN
24
C3
A33
no. 157

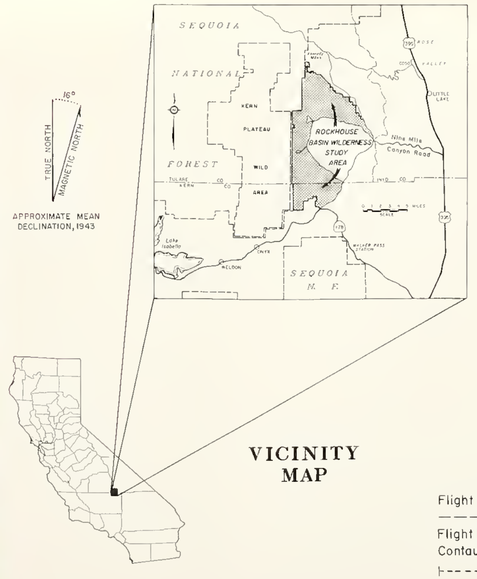
Base map by U.S. Geological Survey 15 minute series, Lamont Peak and a portion of the Onyx quadrangles.



GROUND MAGNETOMETER PROFILE 1 AND 2, ROCKHOUSE BASIN AREA



AEROMAGNETIC PROFILE A-A', RESIDUAL MAGNETIC ANOMALY OVER KERNVILLE METASEDIMENTARY ROCKS AND INTERPRETATION, ROCKHOUSE BASIN AREA



VICINITY MAP

EXPLANATION

Flight elevation - 9000 feet
——— Flight lines
Flight line spacing - 0.5 miles
Contour interval - 20 gammas
|- - - -| Ground magnetometer line

Boundary of the Rockhouse Basin Wilderness Study Area CA-010-029

AEROMAGNETIC MAP OF THE ROCKHOUSE BASIN WILDERNESS AND ADJACENT AREA

(AFTER U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 82-1083)

SCALE 1:62500
1 1/2 0 1 2 3 4 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 FEET
1 0 1 2 3 4 5 KILOMETERS
CONTOUR INTERVAL 60 FEET

Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039.

STATE OF CALIFORNIA—GEORGE DEUKMEJIAN, GOVERNOR
THE RESOURCES AGENCY—GORDON K. VAN VLECK, SECRETARY
DEPARTMENT OF CONSERVATION—RANDALL M. WARD, DIRECTOR

QH
24
C3
A33
no. 157

MAP SHOWING SAMPLE LOCALITIES AND MINES AND PROSPECTS IN THE ROCKHOUSE BASIN WILDERNESS STUDY AREA KERN AND TULARE COUNTIES, CALIFORNIA

Base map by U.S. Geological Survey 15 minute series, Lamont Peak and a portion of the Onyx quadrangles.

SCALE 1:62500

CONTOUR INTERVAL 80 FEET

EXPLANATION

Mine or prospect-number refers to table of mines and prospects

Stream sediment sample

Rock or mineral sample

Boundary of the Rockhouse Basin Wilderness Study Area CA-010-029

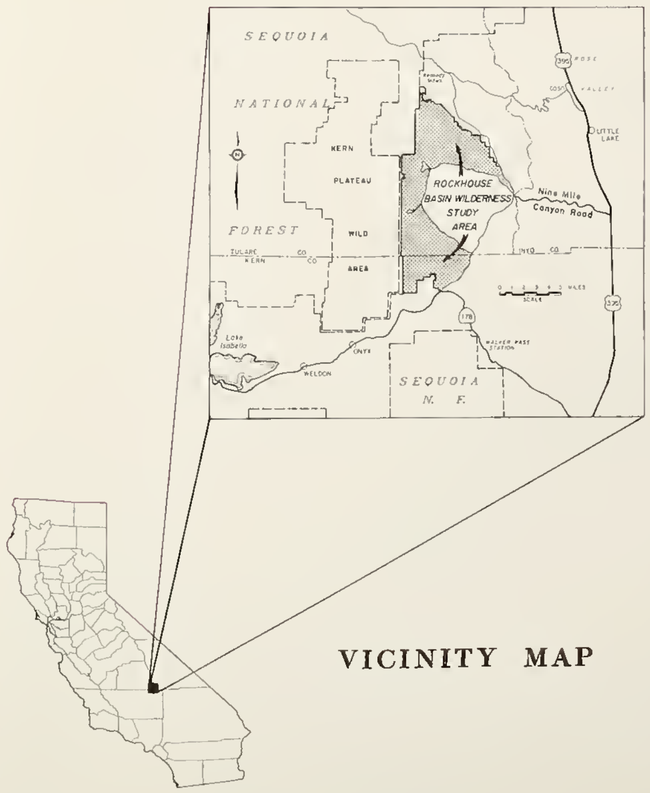
TRUE NORTH
MAGNETIC NORTH
15°

APPROXIMATE MEAN DECLINATION, 1943

SAMPLES COLLECTED BY

G. TAYLOR
C. HEINKE
M. STEINHAUFF
K. ALDRIDGE
R.C. LOYD
J. BURNETT

1983

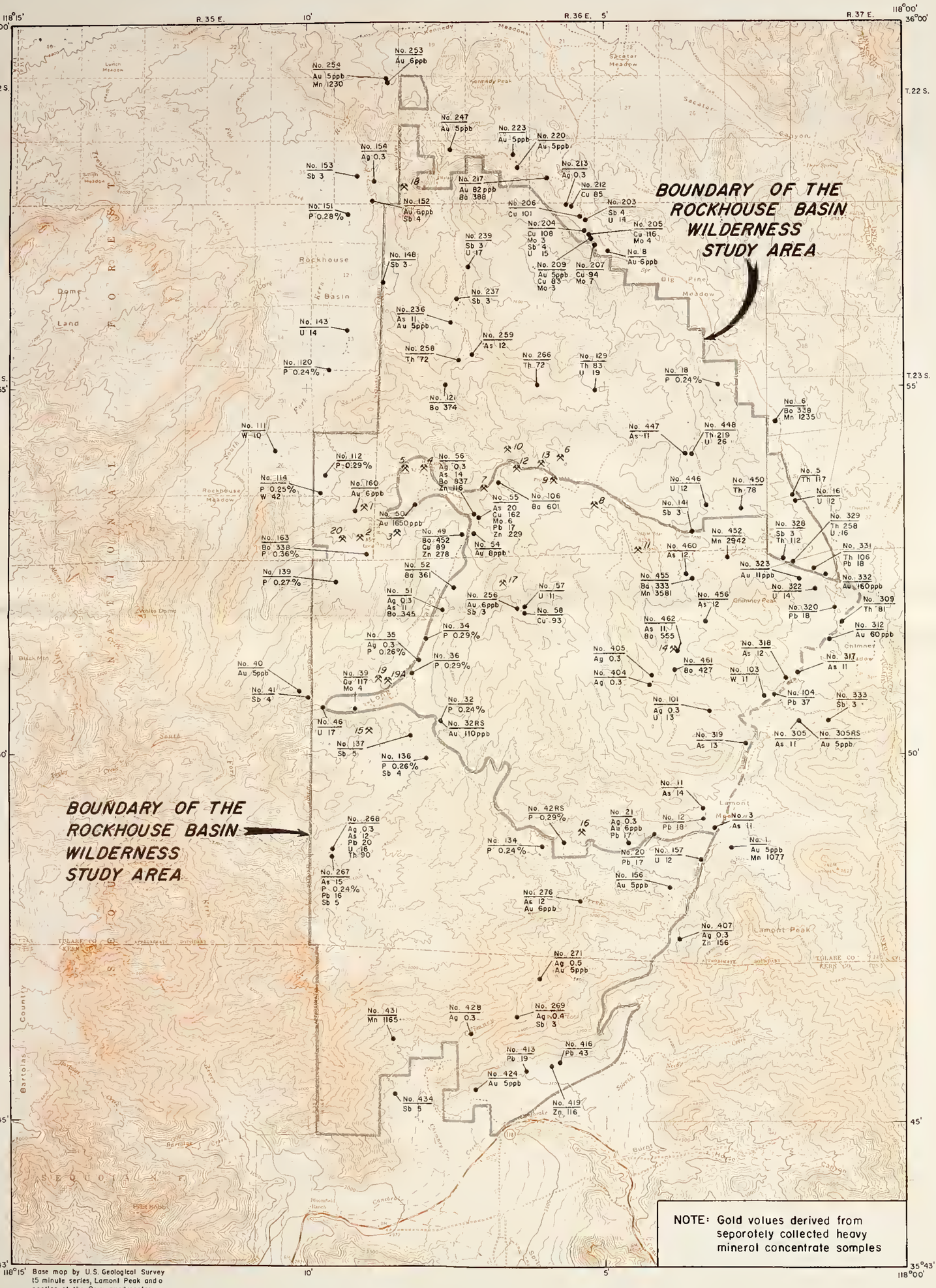


VICINITY MAP

Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039.

+N
84
C3
A33
no.157

MAP SHOWING SAMPLE LOCALITIES WITH ELEMENTS PRESENT IN ANOMALOUS AMOUNTS AND MINES AND PROSPECTS IN THE ROCKHOUSE BASIN WILDERNESS STUDY AREA KERN AND TULARE COUNTIES, CALIFORNIA



NOTE: Gold values derived from separately collected heavy mineral concentrate samples

Base map by U.S. Geological Survey 15 minute series, Lamont Peak and a portion of the Onyx quadrangles.

SCALE 1:62500

1 1/2 0 1 2 3 4 MILES

3000 0 3000 6000 9000 12000 15000 18000 21000 FEET

1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 80 FEET

EXPLANATION

18

Mine or prospect-number refers to table of mines and prospects

No. 455
Ba 333
Mn 3581

Stream sediment sample showing anomalous elements and values
All values in ppm except where indicated

Boundary of the Rockhouse Basin Wilderness Study Area
CA-010-029

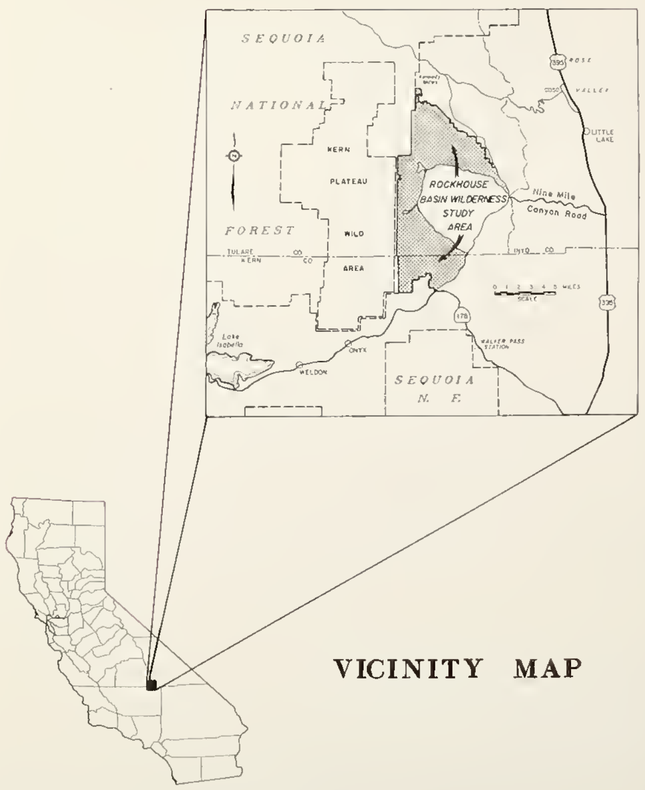
16°
TRUE NORTH
MAGNETIC NORTH

APPROXIMATE MEAN DECLINATION, 1943

SAMPLES COLLECTED BY

G. TAYLOR
C. HEINKE
M. STEINHAUFF
K. ALDRIDGE
R. C. LOYD
J. BURNETT

1983



VICINITY MAP

Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039.

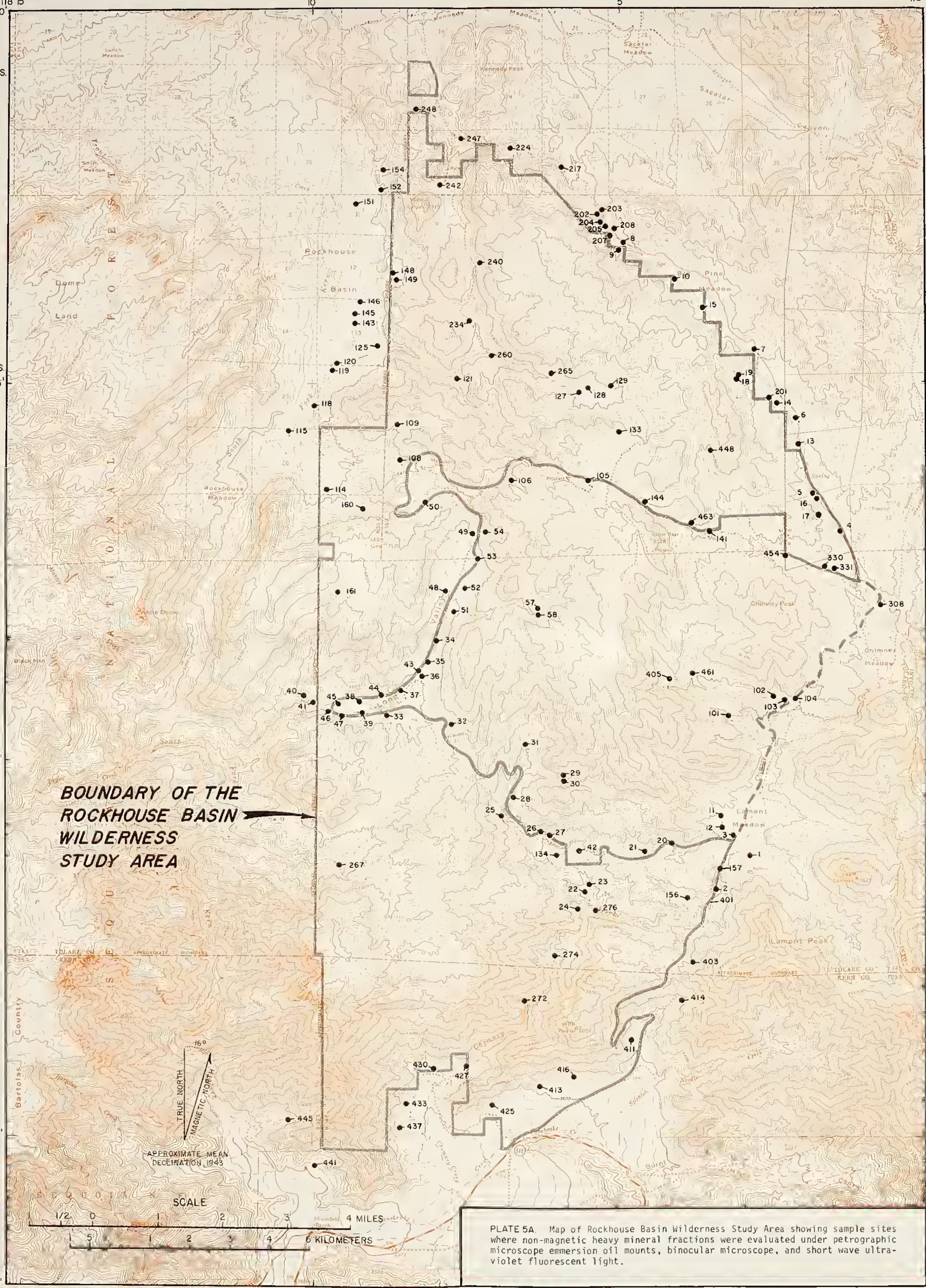


PLATE 5A. Map of Rockhouse Basin Wilderness Study Area showing sample sites where non-magnetic heavy mineral fractions were evaluated under petrographic microscope emmersion oil mounts, binocular microscope, and short wave ultra-violet fluorescent light.

Base map by U.S. Geological Survey 15 minute series, Lamont Peak and a portion of the Onyx quadrangles.

Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039.

TN
27
C3
A33
no. 157

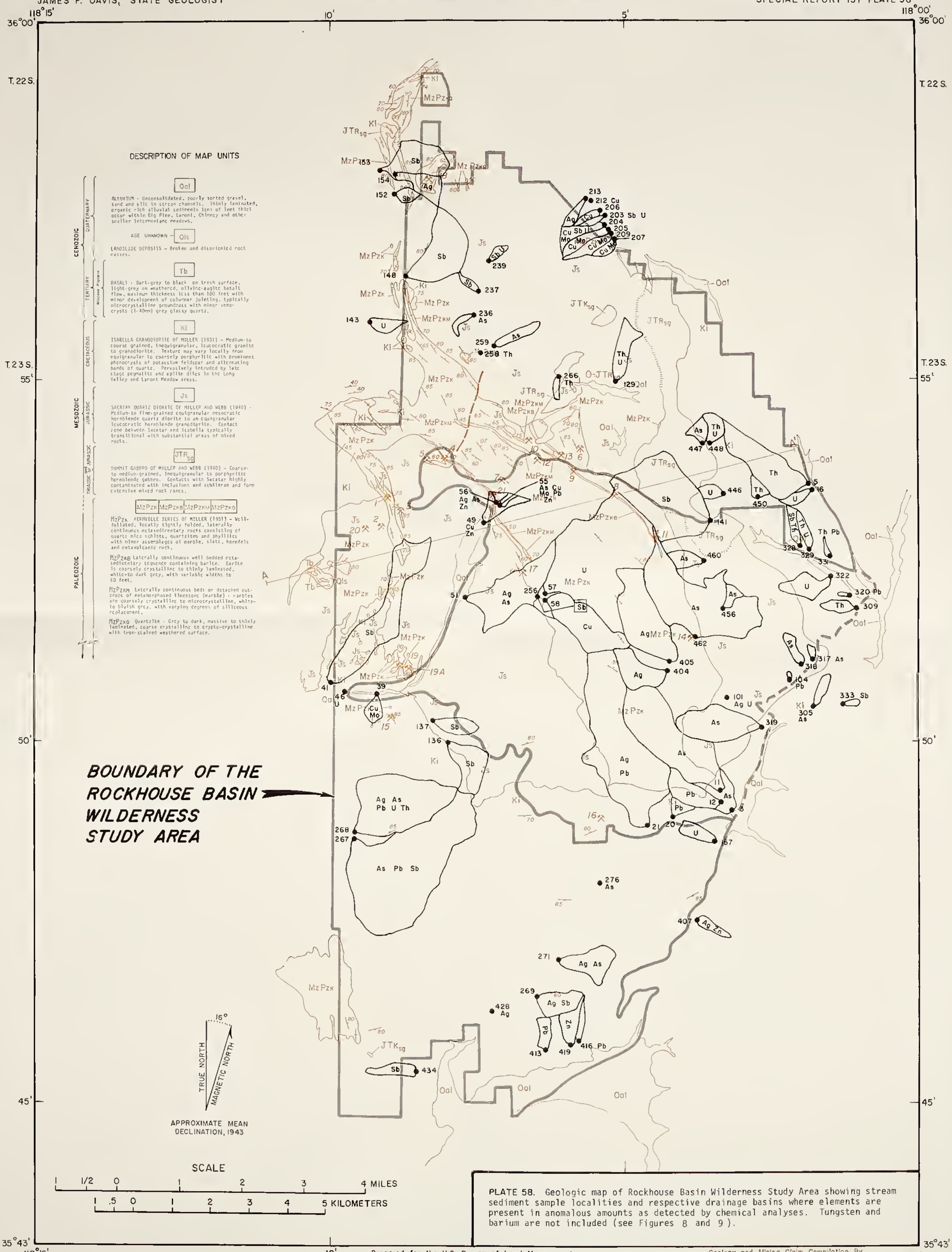


PLATE 58. Geologic map of Rockhouse Basin Wilderness Study Area showing stream sediment sample localities and respective drainage basins where elements are present in anomalous amounts as detected by chemical analyses. Tungsten and barium are not included (see Figures 8 and 9).

Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039.

Geology and Mining Claim Compilation By G.C. Taylor, R.C. Loyd, J.L. Burnett and S.L. Kohler September and October, 1983.

DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA—GEORGE DEUKMEJIAN, GOVERNOR
THE RESOURCES AGENCY—GORDON K. VAN VLECK, SECRETARY
DEPARTMENT OF CONSERVATION—RANDALL M. WARD, DIRECTOR

TN
27
C3
1933
Pt.157

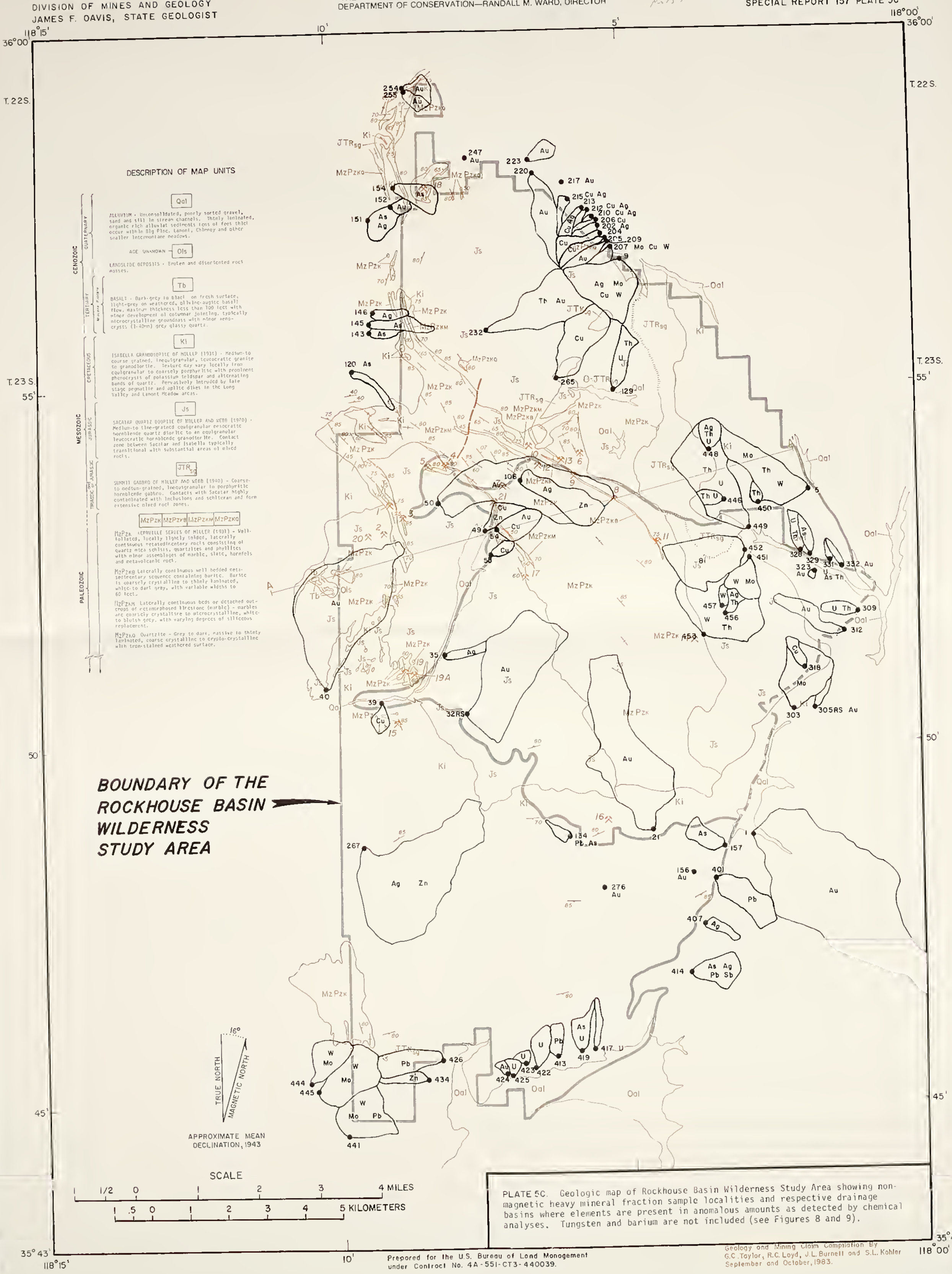


PLATE 5C. Geologic map of Rockhouse Basin Wilderness Study Area showing non-magnetic heavy mineral fraction sample localities and respective drainage basins where elements are present in anomalous amounts as detected by chemical analyses. Tungsten and barium are not included (see Figures 8 and 9).

Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039.

Geology and Mining Claim Compilation By G.C. Taylor, R.C. Loyd, J.L. Burnett and S.L. Kohler September and October, 1983.

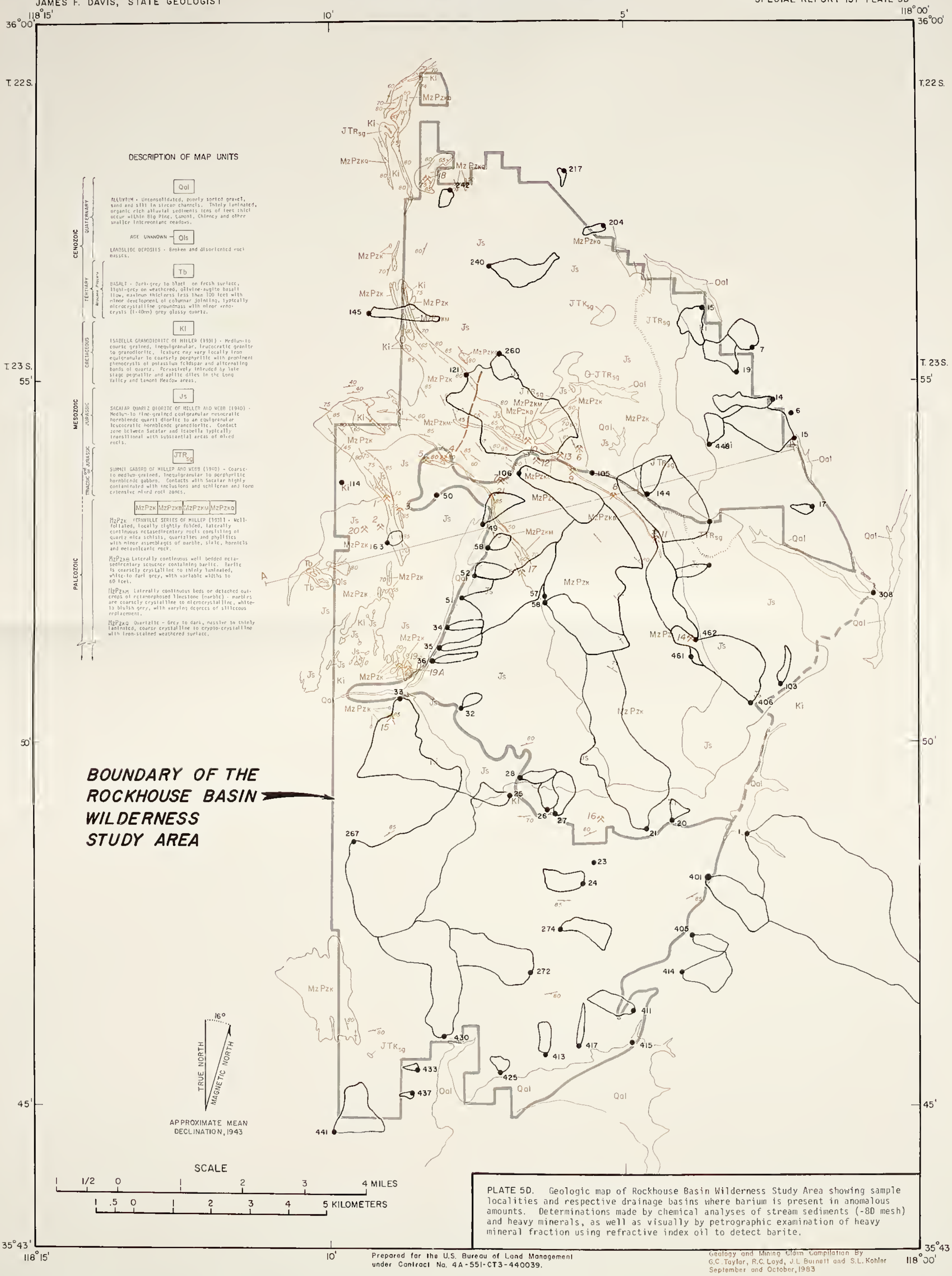


PLATE 5D. Geologic map of Rockhouse Basin Wilderness Study Area showing sample localities and respective drainage basins where barium is present in anomalous amounts. Determinations made by chemical analyses of stream sediments (-80 mesh) and heavy minerals, as well as visually by petrographic examination of heavy mineral fraction using refractive index oil to detect barite.

Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039.

Geology and Mining Claim Compilation By G.C. Taylor, R.C. Loyd, J.L. Burnett and S.L. Kohler September and October, 1983

STATE OF CALIFORNIA—GEORGE DEUKMEJIAN, GOVERNOR
THE RESOURCES AGENCY—GORDON K. VAN VLECK, SECRETARY
DEPARTMENT OF CONSERVATION—RANDALL M. WARD, DIRECTOR

DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

ROCKHOUSE BASIN WILDERNESS STUDY
SPECIAL REPORT 157 PLATE 5E

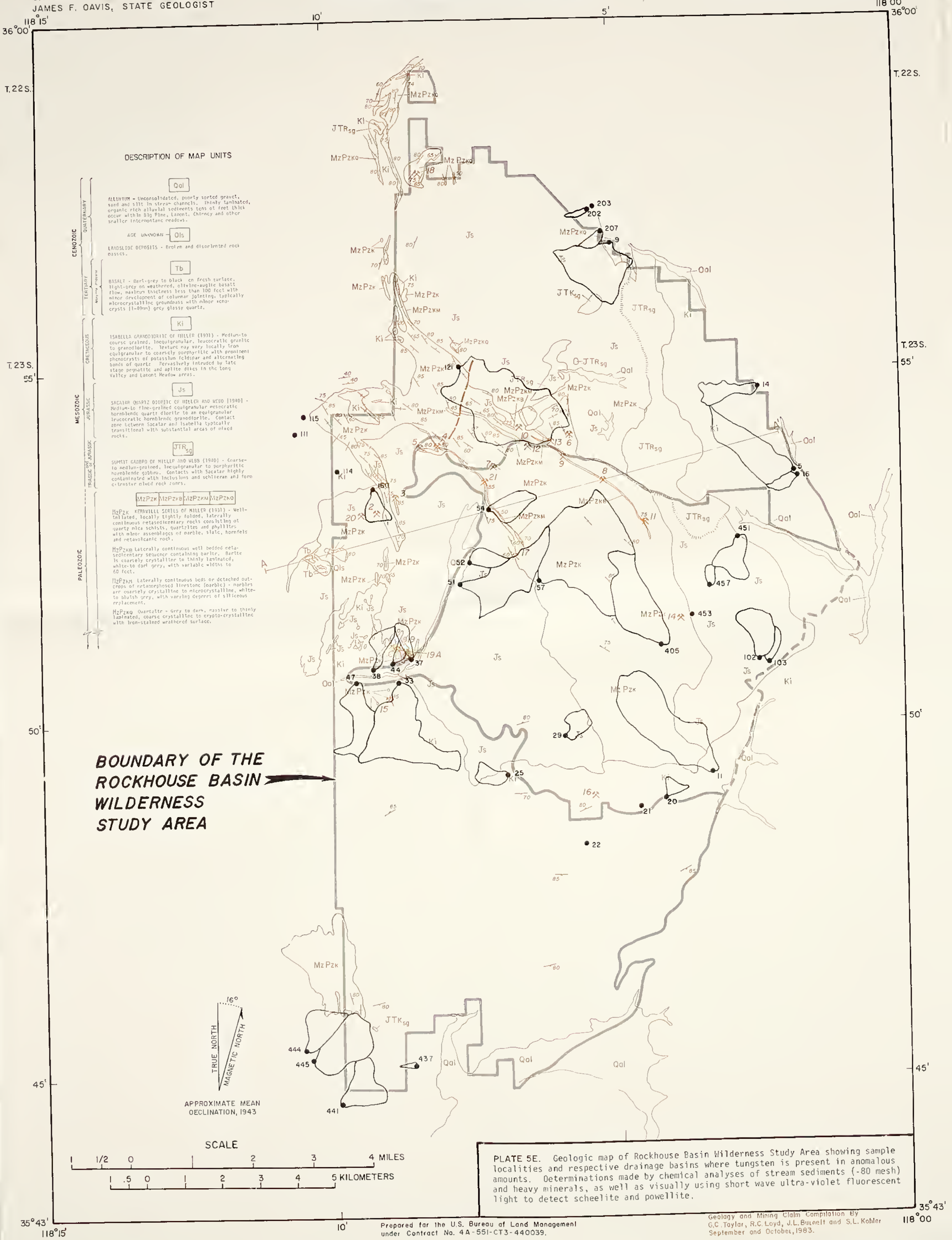


PLATE 5E. Geologic map of Rockhouse Basin Wilderness Study Area showing sample localities and respective drainage basins where tungsten is present in anomalous amounts. Determinations made by chemical analyses of stream sediments (-80 mesh) and heavy minerals, as well as visually using short wave ultra-violet fluorescent light to detect scheelite and powellite.

Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039.

Geology and Mining Claim Compilation By G.C. Taylor, R.C. Loyd, J.L. Burnett and S.L. Kohler September and October, 1983.

TN
97
C3
H32
no. 157

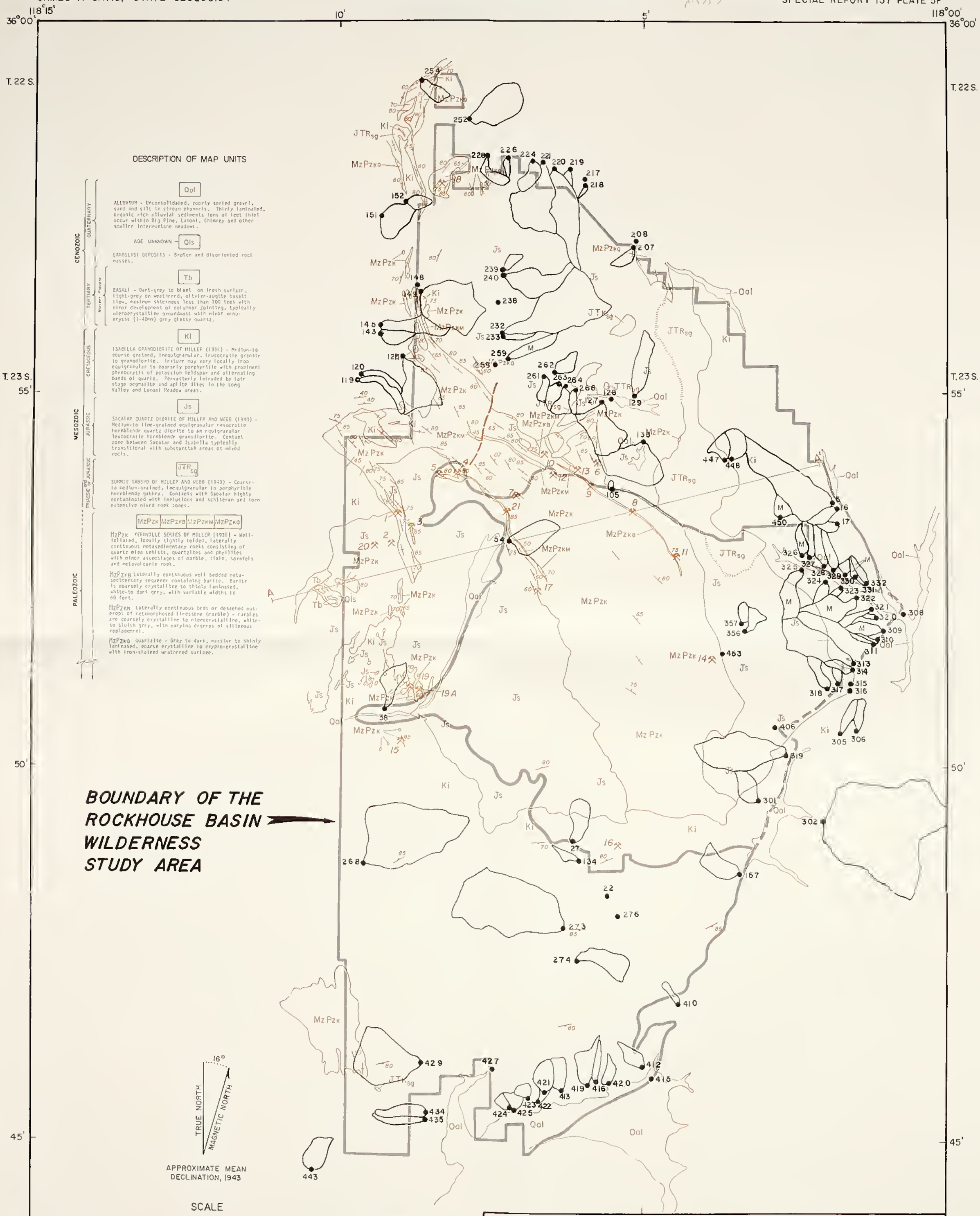


PLATE 5F. Geologic map of Rockhouse Basin Wilderness Study Area showing heavy mineral sample localities and respective drainage basins for samples which are slightly to moderately radioactive. Determinations made using scintillometer. Moderately radioactive samples are indicated by "M".

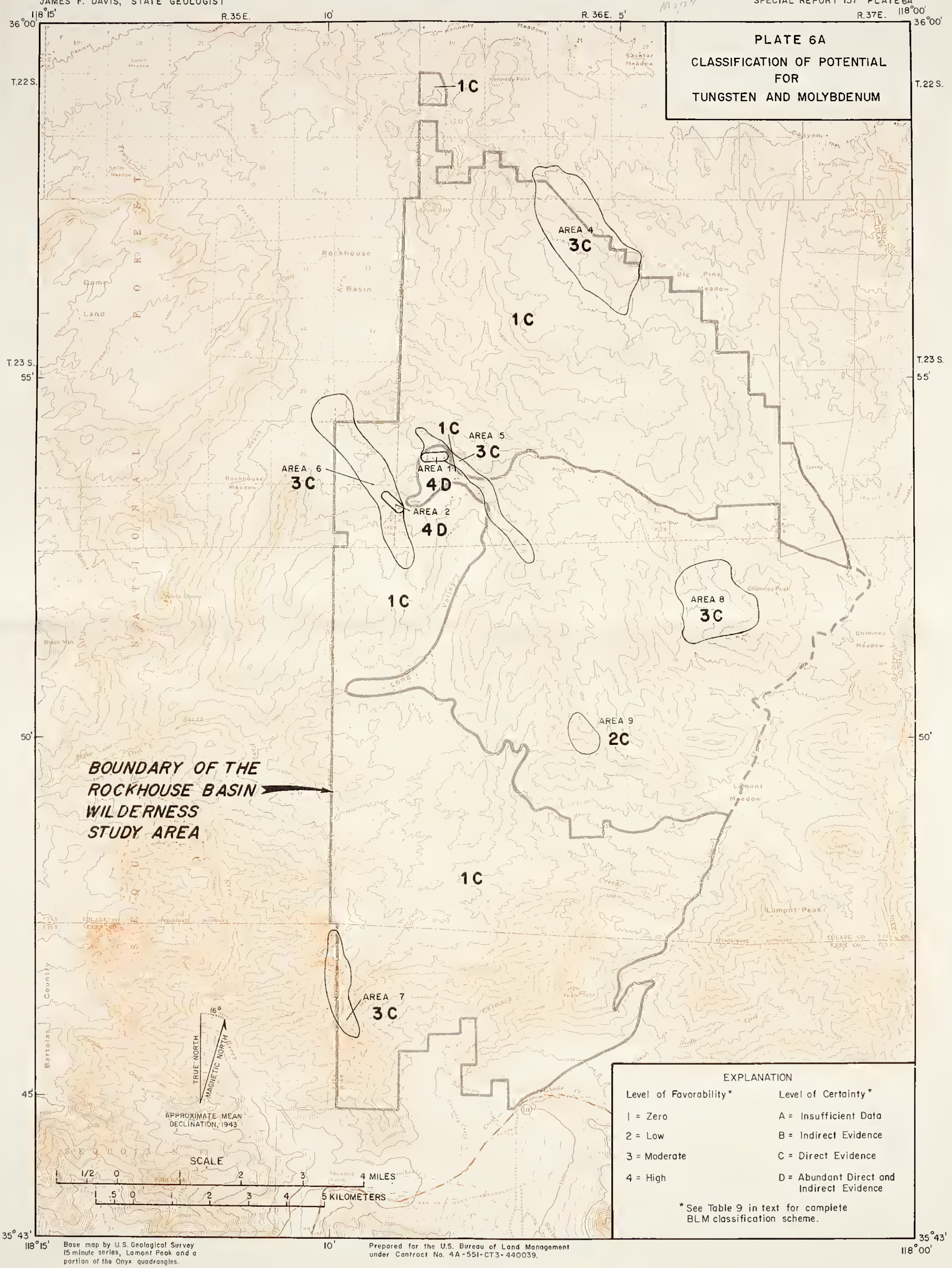
Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039.

Geology and Mining Claim Compilation By G.C. Taylor, R.C. Loyd, J.L. Burnett and S.L. Kohler September and October, 1983.

DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA—GEORGE DEUKMEJIAN, GOVERNOR
THE RESOURCES AGENCY—GORDON K. VAN VLECK, SECRETARY
DEPARTMENT OF CONSERVATION—RANDALL M. WARD, DIRECTOR

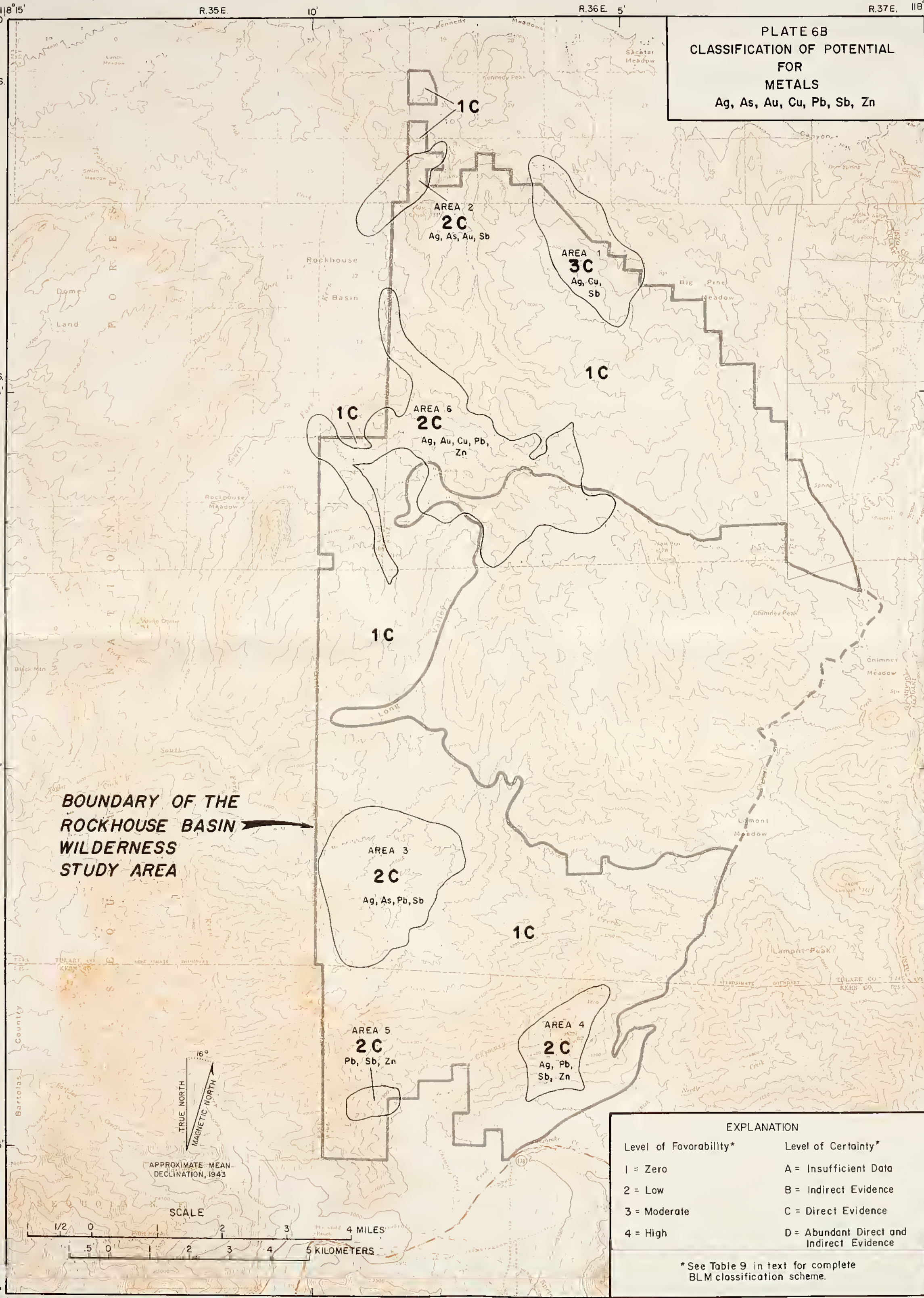
TN
24
C3
A33
no.157



Base map by U.S. Geological Survey 15 minute series, Lamont Peak and a portion of the Onyx quadrangles.

Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039.

TN
24
C3
1733
no. 157



Base map by U.S. Geological Survey 15 minute series, Lamont Peak and a portion of the Onyx quadrangles.

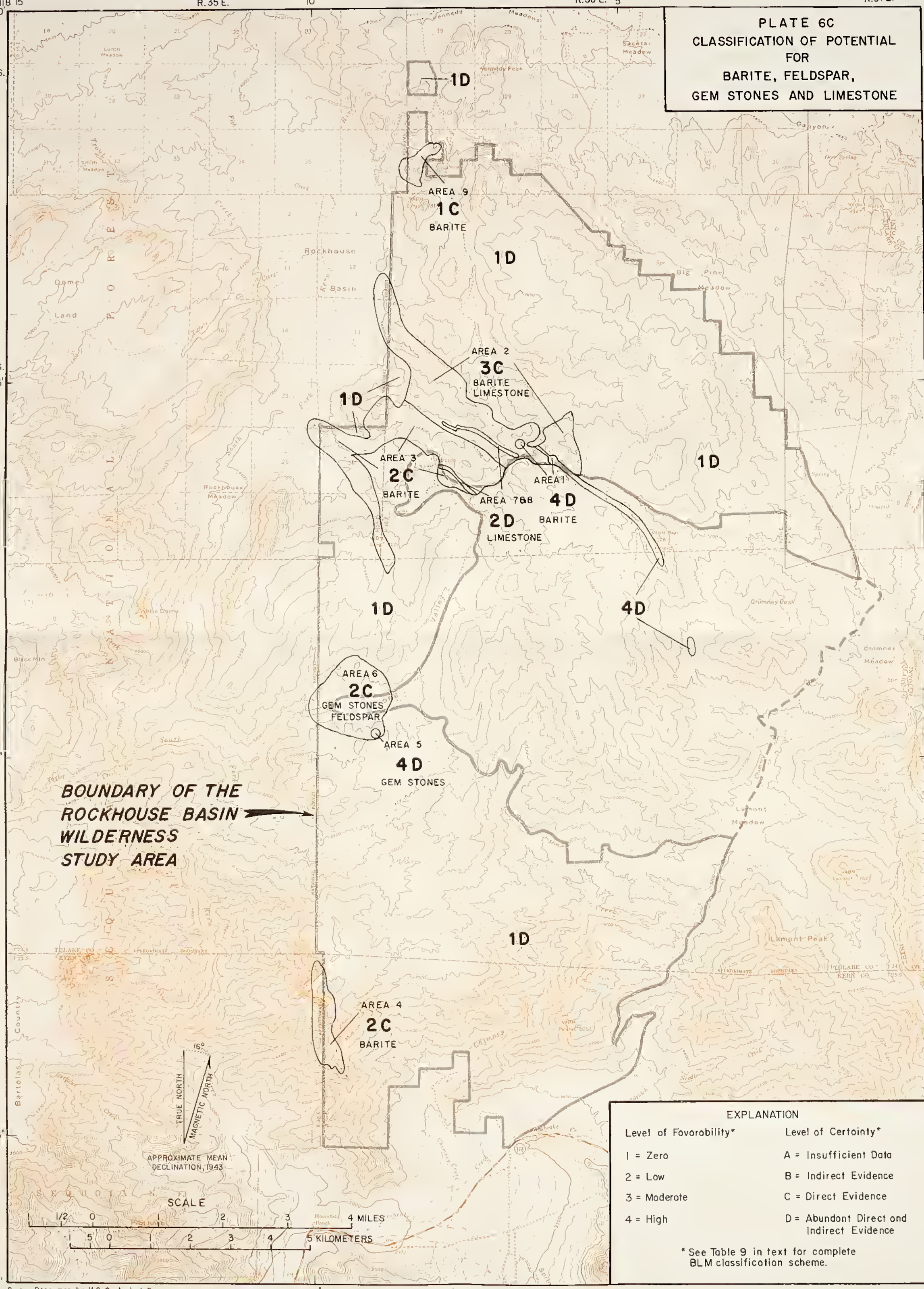
Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039.

DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA—GEORGE DEUKMEJIAN, GOVERNOR
THE RESOURCES AGENCY—GORDON K. VAN VLECK, SECRETARY
DEPARTMENT OF CONSERVATION—RANDALL M. WARD, DIRECTOR

TN
24
C3
A33
no. 157

PLATE 6C
CLASSIFICATION OF POTENTIAL FOR BARITE, FELDSPAR, GEM STONES AND LIMESTONE



EXPLANATION

Level of Favorability*	Level of Certainty*
1 = Zero	A = Insufficient Data
2 = Low	B = Indirect Evidence
3 = Moderate	C = Direct Evidence
4 = High	D = Abundant Direct and Indirect Evidence

* See Table 9 in text for complete BLM classification scheme.

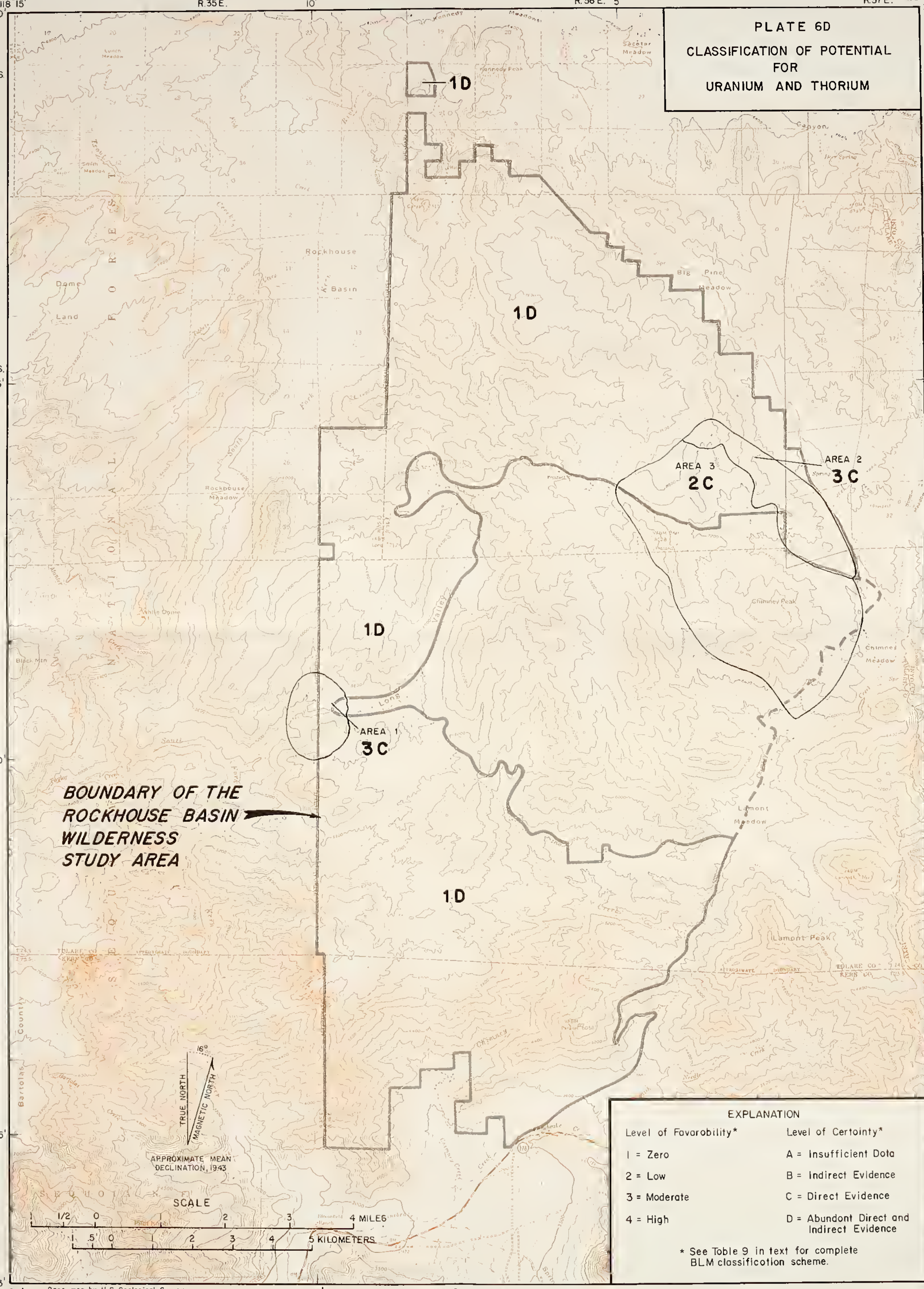
Base map by U.S. Geological Survey 15 minute series, Lamont Peak and a portion of the Onyx quadrangles.

Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039

STATE OF CALIFORNIA—GEORGE DEUKMEJIAN, GOVERNOR
THE RESOURCES AGENCY—GORDON K. VAN VLECK, SECRETARY
DEPARTMENT OF CONSERVATION—RANDALL M. WARD, DIRECTOR

DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

ROCKHOUSE BASIN WILDERNESS STUDY
SPECIAL REPORT 157 PLATE 6D



Base map by U.S. Geological Survey 15 minute series, Lamont Peak and a portion of the Onyx quadrangles.

Prepared for the U.S. Bureau of Land Management under Contract No. 4A-551-CT3-440039.